

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

General Certificate of Education Ordinary Level

MARK SCHEME for the November 2004 question paper

4024 MATHEMATICS

4024/02

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

- CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the November 2004 question papers for most IGCSE and GCE Advanced Level syllabuses.



Mark Scheme Notes

Marks are of the following three types:

- M Method mark, awarded for a valid method applied to the problem. Method marks are not lost for numerical errors, algebraic slips or errors in units. However, it is not usually sufficient for a candidate just to indicate an intention of using some method or just to quote a formula; the formula or idea must be applied to the specific problem in hand, e.g. by substituting the relevant quantities into the formula. Correct application of a formula without the formula being quoted obviously earns the M mark and in some cases an M mark can be implied from a correct answer.
 - A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated method mark is earned (or implied).
 - B Mark for a correct result or statement independent of method marks.
- When a part of a question has two or more "method" steps, the M marks are generally independent unless the scheme specifically says otherwise; and similarly when there are several B marks allocated. The notation DM or DB (or dep*) is used to indicate that a particular M or B mark is dependent on an earlier M or B (asterisked) mark in the scheme. When two or more steps are run together by the candidate, the earlier marks are implied and full credit is given.
 - The symbol $\checkmark$ implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A or B marks are given for correct work only. A and B marks are not given for fortuitously "correct" answers or results obtained from incorrect working.
 - Note: B2 or A2 means that the candidate can earn 2 or 0.
 B2/1/0 means that the candidate can earn anything from 0 to 2.

The following abbreviations may be used in a mark scheme or used on the scripts:

AG	Answer Given on the question paper (so extra checking is needed to ensure that the detailed working leading to the result is valid)
BOD	Benefit of Doubt (allowed when the validity of a solution may not be absolutely clear)
CAO	Correct Answer Only (emphasising that no "follow through" from a previous error is allowed)
CWO	Correct Working Only – often written by a 'fortuitous' answer
ISW	Ignore Subsequent Working
MR	Misread
PA	Premature Approximation (resulting in basically correct work that is insufficiently accurate)
SOS	See Other Solution (the candidate makes a better attempt at the same question)

Penalties

MR -1	A penalty of MR -1 is deducted from A or B marks when the data of a question or part question are genuinely misread and the object and difficulty of the question remain unaltered. In this case all A and B marks then become "follow through $\sqrt{}$ " marks. MR is not applied when the candidate misreads his own figures – this is regarded as an error in accuracy.
OW -1,2	This is deducted from A or B marks when essential working is omitted.
PA -1	This is deducted from A or B marks in the case of premature approximation.
S -1	Occasionally used for persistent slackness – usually discussed at a meeting.
EX -1	Applied to A or B marks when extra solutions are offered to a particular equation. Again, this is usually discussed at the meeting.

November 2004

GCE O LEVEL

MARK SCHEME

MAXIMUM MARK: 100

SYLLABUS/COMPONENT: 4024/02

**MATHEMATICS
PAPER 2**



Page 1	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – NOVEMBER 2004	4024	2

1	Incorrect work in any one part may be used to earn M marks in any other part of the question. Throughout, accept equivalent complete methods and decimal angles without degree sign, but degree sign essential if answer is given in degrees and minutes. (a) (AD =) $8\sin 35$ 4.585 to 4.595 (m) (b) (CE =) $\frac{8}{\cos 35}$ 9.76(0) to 9.77(0) (m) (c) (A $\hat{B}$ C =) $47(^{\circ})$ and (A $\hat{C}$ B =) $55(^{\circ})$ so (AB =) $\frac{8\sin(\text{their } 55)}{\sin(\text{their } 47)}$ (= 8.96...) 8.955 to 8.965 (m) OR Complete alternative method: M2 A1	M1 A1 2 M1 A1 2 B1 M1 A1 3	7
2 (a)(i)	$-\frac{4}{3}$ seen, isw or -1.33 or better	B1 1	
(ii)	$y = -\frac{4}{3}x + \frac{10}{3}$ <u>or</u> $4x + 3y = 10$ OR 3 term equivalent OR $y = -\frac{4}{3}x + c$ and $c = \frac{10}{3}$ seen isw. After B0, allow B1 for straight line with gradient $-\frac{4}{3}$ or their (i) OR B1 for 3 term straight line through (4, -2). $y = -1.33x + 3.32$ scores B1 B0 but allow B2 for $y = -1.33x + 3.33$	B2 2	
(b)(i)	(AB =) 5 (units)	B1	
(ii)	(BC =) 10 (units)	B1	2
(c)	$AC^2 = 5^2 + 10^2 = AB^2 + BC^2$ seen o.e. OR Gradient of BC = $\frac{6}{8}$ <u>and</u> $\frac{6}{8} \times \left(-\frac{4}{3}\right) = -1$ o.e.	B1 (B1)	1
(d)	$25 \text{ (units}^2\text{)} \text{ or } \frac{1}{2} \text{ (their (b)(i))} \times \text{(their (b)(ii))} \sqrt{}$	B1 ✓	1
		7	

Page 2	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – NOVEMBER 2004	4024	2

3 (a) $\frac{4}{4+5+7} \times 80\,000\,000$ OR $\frac{5}{4+5+7} \times 80\,000\,000$ OR $\frac{7}{4+5+7} \times 80\,000\,000$ 20 000 <u>and</u> 25 000 000 <u>and</u> 35 000 000 (b) 9 600 000 isw (c)(i) 5 000 000 OR $\frac{25}{100} \times$ their 20 000 000 $\checkmark$ (ii) (Loss on Beta =) $\frac{10}{100} \times$ their 25 000 000 (= 2 500 000) If selling price used, allow M1 for $\frac{90}{100} \times 25\,000\,000$ (= 22 500 000) { (Profit on Gamma =) <i>their</i> 9 600 000 – [<i>their</i> 5 000 000 – <i>their</i> 2 500 000] (= 7 100 000) and (Percentage =) $\frac{\text{Their } 7\,100\,000}{\text{Their } 35\,000\,000} \times 100$ o.e. 20 $\frac{2}{7}$ OR 20.25 to 20.35 (%) cao (d) $\frac{100}{160} \times 80\,000\,000$ 50 000 000 Accept such as 20 m for 20 000 000 throughout. Accept in standard form or equivalents (such as 20×10^6).	M1 A1 2 B1 1 B1 $\checkmark$ 1 M1 M1 A1 3 M1 A1 2 9
4 (a)(i) States AB = BC OR sides of square (ABCD) are equal Correctly deduces PB = QC (must mention AP = BQ) (ii) BQ = CR seen P $\hat{B}$ Q = Q $\hat{C}$ R seen Deduces triangles BPQ and CQR congruent, dep on no extra facts (iii) R $\hat{Q}$ C = Q $\hat{P}$ B OR P $\hat{Q}$ B = Q $\hat{R}$ C stated or implied Correctly deduces P $\hat{Q}$ R = 90° with no errors seen (e.g. $\hat{P} + \hat{Q} + \hat{B} = 180^\circ$ or $\hat{P} + \hat{Q} = 90^\circ \Rightarrow R \hat{Q} C + P \hat{Q} B = 90^\circ$) (b) PQ = QR (= RS)(= SP) stated P $\hat{Q}$ R = Q $\hat{R}$ S (= R $\hat{S}$ P)(= S $\hat{P}$ Q) stated etc. OR P $\hat{Q}$ R = 90° Two <u>different</u> reasons required, but proof not needed. [Condone use of numerical or literal values throughout.]	M1 A1 2 M1 M1 A1 3 M1 A1 2 B1 B1 2 9

Page 3	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – NOVEMBER 2004	4024	2

5 (a)(i) 120 (ii) $(l =) \frac{25}{n} - a$ or $\frac{2s - an}{n}$ (Mark <u>Final Answer</u>) After B0, allow B1 for $25 = an + ln$ OR $\frac{2s}{n} = a + l$ seen. (b)(i) $(t =) 0$ $\frac{12}{5}, 2\frac{2}{5}$ or 2.4 isw (ii) $(y - 1)^2 = 16$ or 2×8 o.e. soi OR $y - 1 = 4, -4$ or ± 4 $(y =) 5$ and -3 (c) <u>Formula</u> For numerical $\frac{p \pm (\text{or } + \text{or } -)\sqrt{q}}{r}$ seen or used, allow B1 for $p = -9$ and $r = 6$ and B1 for $q = 21$ or $\sqrt{q} = 4.58\dots$ OR <u>Completing Square</u> Allow B1 for $\left(x + \frac{3}{2}\right)^{(2)}$ or equivalent and B1 for $\frac{7}{12}$ or square roots, such as $\pm 0.763\dots$ $(x =) \quad \quad \quad -(0).74$ (Final answer) -2.26 nww After B0 + B0, allow B1 for both $-0.736\dots$ and $-2.263\dots$ seen OR for both -0.74 and -2.26 seen somewhere.	B1 1 B2 2 B1 B1 2 M1 A1+A 3 1 B1 B1 B1 B1 4 12
6 (a)(i) $(EC =) 5 \text{ cm}$ (ii) $\sin C \hat{A} D = \frac{5 \text{ or their (a)(i)}}{13 \text{ or } [8 + \text{their (a)(i)}]}$ ($= 0.3846\dots$) $(C \hat{A} D =) 22.55(^{\circ})$ to $22.65(^{\circ})$ (b)(i) $(Q \hat{P} R =) 70(^{\circ})$ (ii) $(Q \hat{Z} X =) \frac{1}{2}(180 - 52)$ OR $Q \hat{Z} X = Q \hat{X} Z$ stated $(Q \hat{Z} X =) 64(^{\circ})$ (iii) $(Z \hat{X} Y =) 55^{\circ}$ After B0, allow B1 for $R \hat{X} Y = 61^{\circ}$ or $Z \hat{O} Y = 110^{\circ}$	B1 1 M1 A1 2 B1 1 M1 A1 2 B2 2 8

Page 4	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – NOVEMBER 2004	4024	2

7	Incorrect work in any one part may be used to earn M marks in any other part of the question. Throughout, accept equivalent complete methods and decimal angles without degree sign, but degree sign essential if answer is given in degrees and minutes. (a) $51^2 + 72^2 \pm 2 \times 51 \times 72 \cos 81$ o.e. soi Correct formula, simplification and square root intended soi by subsequent values dep (AB =) 81.4(0) to 81.5(0) (m) After A0, allow A1 for 6636... or 8933... or 94.5... seen (dep on first M1) (b) (Area of ABC =) $\frac{1}{2} 72 \times 51 \sin 81$ 1810 to 1820 (m²) (c) Their (b) or better $\frac{1}{2}$ their (a) 44.45 to 44.55 (m) (d) (CT =) $72 \tan 15$ 19.25 to 19.35 (m) (e) $\tan \alpha = \frac{\text{Their (d)}}{\text{their (c)}} (= 0.433...)$ (Angle =) 23.4(0)(°) to 23.5(0) (°)	M1 M1 A2 4 M1 A1 2 M1 A1 2 M1 A1 2	12
8 (a)	States or implies points of contact and centres collinear [e.g. (Diameter =) $2x + 2y$ or $2(x + y)$ seen] Justifies radius = $x + y$ A.G. Accept correct expressions without explanation. (b)(i) $\pi (x + y)^2 - \pi (2x)^2$ seen isw or better (ii) $\pi (2y)^2 - \pi (x + y)^2$ seen isw or better OR $\pi (2y)^2 - \text{their (i)} - \pi (2x)^2$ (c) Their (b)(ii) = $2 \times \text{their (b)(i)}$ o.e. (possibly without π) (π) $[4y^2 - x^2 - 2xy - y^2] = 2 (\pi) [x^2 + 2xy + y^2 - 4x^2]$ or better OR (π) $(y - x)(3y + x) = 2 (\pi) (y - x)(y + 3x)$ Correctly deduces $y^2 - 6xy + 5x^2 = 0$ www A.G. (d)(i) $(y - x)(y + 5x)$ o.e. seen (ii) $y - x$ seen (but may be cancelled) $y - 5x$ seen Extra answers –1 each (e) (Fraction =) $\frac{(\pi)(6x)^2 - (2x)^2}{\pi(10x)^2}$ or $\frac{\text{their (b)(i)}}{\pi(2y)^2}$ with $y = 5x$ $\frac{8k}{25k}$ isw unless condensed, 0.32 or 32%	B1 B1 2 B1 B1 2 M1 A1 A1 3 B1 B1 B1 3 M1 A1 2	12

Page 5	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – NOVEMBER 2004	4024	2

9 (a)	$25^2 - 24^2 = 1 \times 49 = 7^2$ o.e. (so 7, 24, 25 is Pythagoras Triple) Expect to see some justification	A.G.	B1	1
	(b)(i) 9 soi www		B1	
	(ii) 60, 61 soi www		B1	2
	(c)(i) $2n + 1$ or $n + n + 1$		B1	1
	(ii) Equates their (i) = 101^2 or better Obtains 5100, 5101 soi www		M1 A1	2
	(d)(i) (12)..... $(37 - 35)(37 + 35) = 2 \times 72 = 144 = 12^2$ (Expect to see some justification) 63, 65 soi www 2×128 soi or better	indep	B1 B1	1 2
	(ii) $\{(4n^2 + 1) + (4n^2 - 1)\} \{(4n^2 + 1) - (4n^2 - 1)\}$ or better OR $16n^4 + 8n^2 + 1 - (16n^4 - 8n^2 + 1)$ or better $(4n)^2$ OR 4^2n^2 Condone $4n$ if seen after $16n^2$, but www		B1 B1	2
	(iii) 39 999, 40 001 soi www		B1	1
	Throughout, allow correct answers implied www Terms in correct order in equations (e.g. <u>not</u> $24^2 - 25^2 = 7^2$)			12
10 (a)(i)	$100\pi = \pi r^2 h$ seen, leading to $h = \frac{100}{r^2}$	A.G.	B1	1
	(ii) $\pi y = 2\pi rh + 2\pi r^2$ soi Convincingly leading to $y = 2r^2 + \frac{200}{r}$	A.G.	B1	1
	(b)(i) ($p =$) 105 (105.3...or $105\frac{1}{3}$ acceptable)		B1	1
	(ii) All 7 points plotted $\checkmark$ (P1 for at least 5 plotted $\checkmark$) Smooth curve, not grossly thick, through all plotted points, of which at least 5 correct $\checkmark$		P2 C1	3
	(c) 2.2(0) to 2.27 5.65 to 5.75		Y2	2
	(d) Drawing a tangent at $r = 2$ and estimating $\frac{\text{change in } y}{\text{change in } r}$, ignoring sign (Check working is valid) -35 to -48 (Ignore support from Calculus)		M1 A1	2
	(e)(i) 3.6 to 3.8		R1	
	(ii) Value of A in the range $80\pi \leq A < 82\pi$ or $251 \leq A \leq 257$ seen <u>Note</u> Not $A = 82\pi$ or $80 \leq A < 82$ Ignore any unit stated		L1	2
				12

Page 6	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – NOVEMBER 2004	4024	2

11 (a)	(0) (4) 30 80 136 (140) (0) 10 30 60 15 140	B1 B1	2
(b)	Ignore plots at $x = 0$ [Accept two separate graphs] All 10 other points plotted ✓ (P1 for at least 6 plotted ✓) [Some points may represent 2 plots] 2 smooth curves, with at least one label, not grossly thick, through all appropriate plots of which at least 6 correct Curves must be ogive shape (no negative gradients)	P2 C1	 3
(c)(i)	64 to 68	V1	
(ii)	Their (i) – (42 to 44) evaluated ✓	Q1	
(iii)	English 56 to 58 <u>and</u> Maths 63 to 65	N1	3
(d)	Maths easier ✓, with sensible reason (e.g. greater median, or U.Q. L.Q. etc.) (Follow through from their curves if labelled) (There must be two curves)	R1	1
(e)(i)	$\frac{12}{49}$ cao	B1	1
(ii)	$\frac{4}{140} \times \frac{115}{140} + \frac{25}{140} \times \frac{136}{140}$ $\frac{193k}{980k}$ isw (e.g. $\frac{3860}{19600}$) OR 0.1965 to 0.1975 OR 19.65 to 19.75% After M0 allow SCB1 for $\frac{3860}{140 \times 139} = \frac{3860}{19460} = \frac{193k}{973k}$ or 0.1980 to 0.1990 isw	M1 A2	 2
12			

MARK SCHEME for the November 2005 question paper

4024 MATHEMATICS

4024/02

Paper 2 maximum raw mark 100

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

- CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the November 2005 question papers for most IGCSE and GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



Page 1	Mark Scheme	Syllabus	Paper
	GCE O Level – November 2005	4024	2

1		Nonsense in one part may be used to earn M marks in any other part of the question Throughout accept equivalent complete methods and decimal angles without degree sign, but degree sign essential if answer in degrees and minutes		
(a)	$ABO = 90^\circ$ with reason	B1	1	
(b) (i)	$\sin OAB = 6/13$ (= 0.4615...) or $OAB = 27.48^\circ$ or $\sin$ (leads to $OAB = 27.5^\circ$) AG	B1	1	
(ii)	$\frac{15}{\tan 27.5}$	M1		
	28.8 to 28.9 (cm)	A1	2	
(iii)	$2(\text{their } AC)\sin 27.5$ or $2 \times 15 \cos 27.5$	M2		
	or $EPC = 2[90 - 27.5]$ (= 125)			
	and $\sqrt{15^2 + 15^2 - 2 \times 15 \times 15 \cos(\text{their } 125)}$ (M2)			
	26.55 to 26.65 (cm)	A1	3	7
2 (a)		B2	2	
	(t =) 2 $\frac{1}{3}$, 2.33 or better After B0, allow B1 for $t = 7/3$ or 2.3 or 3 or for $3t = 7$ seen			
(b)	$x = -2.5$ or $-2\frac{1}{2}$ and $y = 17$ After B0, allow B1 for one value found with no errors or allow M1 for correct method to eliminate one variable (reaching such as $4y = k$, $ky = 68$, $8x = k$ or $kx = -20$)	B2	2	
(c)	$(y + 2)(y - 2)$ sol $(3y + 2)(y + 2)$ sol	B1 B1		
	$3y + 2$ obtained with no errors seen $y - 2$	B1	3	
(d)	Collect terms e.g. $2x + gx = 2f - 3h$ Factorise e.g. $x(2 + g) = 2f - 3h$ $2f - 3h$ $2 + g$	M1 M1 A1	3	10

Page 2	Mark Scheme	Syllabus	Paper
	GCE O Level – November 2005	4024	2

3 (a) (i) $(\angle DCA =) 90^\circ$ (angle in semicircle)	B1		
(ii) $(\angle DAC =) 34^\circ$ or $124 - \text{their (i)}$ (angle sum of triangle)	B1		
(iii) $(\angle CBA =) 124^\circ$ (opposite angles of cyclic quad)	B1		
(iv) $(\angle AEB [= \angle ADB] =) 28^\circ$ (angles in same segment)	B1	4	
Lack of reason loses B1 on first occasion only			
(b) $\angle EBD = 28^\circ$ (alternate angles) Reason needed	B1		
Deduces $\angle BDX$ or $\angle BDA = \angle EBD$			
And hence triangle BDX is isosceles	indep B1	2	
(c) $(\angle ABE =) 62^\circ$	B1	1	
(d) Convincingly shows X is the centre of the circle e.g. Deduces triangle ABX is isosceles, so $AX = BX = DX$	B1	1	8
4 (a) Correct, labelled, diagram representing 4, 7, 6, 5, 2, 0, 1 After B0, allow B1 for diagram without labels or labelled diagram with at least 4 values correct	B2	2	
(b) (i) (Median $=$) $2\frac{1}{2}$	B1		
(ii) (Mode $=$) 1	B1		
(iii) (Mean $=$) 1.92 or $48/25$ or	B1	3	
(c) $\frac{k}{5k}$, 0.2 or 20%	B1	1	
(d) $\frac{k}{25k}$, 0.04 or 4%	B2	2	
After B0, allow B1 for $\frac{k}{50k}$, 0.02 or 2% or $\frac{24}{625}$, 0.0384 or 3.84%			
(e) Uses 2×6 cars or total number of cars (48)	M1		
$\frac{k}{4k}$, 0.25 or 25%	A1	2	(i)

Page 3	Mark Scheme	Syllabus	Paper
	GCE O Level – November 2005	4024	2

5 (a) (i) Lists 5 different ways e.g. on 4017 (1, 1, 1, 1), (2, 1, 1), (1, 2, 1), (1, 1, 2), (2, 2) [on 4024, (10, 10, 10, 10), (20, 10, 10), (10, 20, 10), (10, 10, 20), (20, 20)]	B1		
(ii) Lists 8 different ways or justifies it is 5 ways with 10 cents first + 3 ways with 20 cents first	B1	2	
(b) (i) $a = 13$ $b = 21$ or 8 + their (i) $\int$	B1 B2 $\int$	3	
(ii) $z = x + y$ oe	B1	1	6
6 (a) $\frac{24}{x}$	B1	1	
(b) $\frac{24}{x + 0.5}$ oe	B1	1	
(c) $\frac{24}{x} - \frac{24}{x + 0.5} = \pm 2 \int$ soi oe, but must contain x in 2 terms	M1 $\int$		
Correct method to remove fractions, e.g. $24(x + 0.5) - 24x = \pm 2x(x + 0.5) \int$ oe (but must have contained x in 2 different denominators)	M1 $\int$		
Obtain $2x^2 + x - 12 = 0$ AG	A1	3	
(d) Formula For numerical $\frac{p \pm \sqrt{q}}{r}$, (not $\pm p$) seen or used, Allow B1 for $p = -1$ and $r = 4$ and B1 for $q = 97$ or $\sqrt{q} = 9.84...$ soi	B1 B1		
Complete square Allow B1 for $(x + \frac{1}{4})^2$ or $(x + \frac{1}{4})$ oe soi and B1 for $97/16$ or square roots such as 2.46... or $\frac{9.84...}{4}$			
Final answers Allow B1 for each of 2.212 and -2.712 nww or allow B1 for both 2.21 and -2.71 seen or allow B1 for both 2.2122... and -2.7122... seen	B2	4	
(e) Time = $\frac{24}{\text{their 2.212}}$ (-10.8...)	M1		
10 minutes 50 to 52 seconds	A1	2	11

Page 4	Mark Scheme	Syllabus	Paper
	GCE O Level – November 2005	4024	2

7 (a) (i) $\frac{1}{2} \times 0.6^2 (= 0.5655)$ seen 1.520 to 1.530 (m ²)	M1 A1	2	
(ii) $2 \times 2.2(2.5 + 3.6) (= 26.84)$ oe soi Their 26.84 - their (i) = $1.9 \times 0.9 (= 23.604...)$ Leading to 23.6 (m ²) AG	M1 A1	2	
(b) (i) Increased area = 23.6×1.12 oe $(= 26.43... \text{ or } 26.44)$ Number of tiles = $\frac{\text{their } 26.4}{0.25^2}$ = 422 to 424	M1 indep M1 A1	3	
(ii) Number of boxes = $\frac{\text{their } 423}{20}$ (leading to 22) Cost = \$ 330 cao	M1 A1	2	
(iii) Division by 120 soi $\frac{20}{120} \times 15$ or $\frac{100}{120} \times 15$ soi \$ 2.5	M1 M1 A1	3	12

Page 5	Mark Scheme	Syllabus	Paper
	GCE O Level – November 2005	4024	2

8	Nonsense in one part may be used to earn M marks in any other part of the question. Throughout accept equivalent complete methods and decimal angles without degree sign, but degree sign essential if answer is given in degrees and minutes.			
(a) (i)	292°	BI	1	
(ii)	$72^2 + 60^2 \pm 2 \times 72 \times 60 \cos 75$ oe soi	M1		
	Correct formula, simplification and a square root taken, seen or implied by subsequent values	M1		
	80.85 to 80.95 (m)	A2	4	
	After A0, allow A1 for 65.47 or 11020 or 104.9 seen, (dep on first M1)			
(iii)	$\frac{\sin B}{60} = \frac{\sin 75}{\text{their (i)}}$ soi	M1		
	$\sin ABC = \frac{60 \sin 75}{\text{their (ii)}}$ (= 0.7162...)	M1		
	45.70 to 45.80°	A1	3	
(iv)	157.70 to 158 or {their (i) + their (iii) - 180} ↗	BI ↗	1	
(b)	(Height of kite =) $72 \tan 24$ (=32.05)	M1		
	$\tan \alpha = \frac{\text{their height}}{60}$ (= 0.534...)	M1		
	28.05 to 28.15°	A1	3	
	Some possible answers			12

Page 6	Mark Scheme	Syllabus	Paper
	GCE O Level – November 2005	4024	2

9 (a) $\sqrt{57^2 + 12^2}$ or seen [leading to 13 AG]		B1	1	
(b) (i) $\pi \times 5 \times 13$ so $(= 65\pi = 204.2)$		M1		
$2\pi \times 5^2$ so $(= 50\pi = 157.1)$	indep	M1		
Their $65\pi +$ their $50\pi + k\pi \times 5^2$ where $k =$ integer (provided all terms are areas)	indep	M1		
361.0 to 362.0 (cm ²)		A1	4	
(ii) $\frac{1}{2} \pi \times 5^2 \times 12$ so $(= 100\pi = 314.2)$		M1		
$4\pi \times 5^2$ so $(= 250\pi/3 = 261.8)$	indep	M1		
575.5 to 576.5 (cm ³)		A1	3	
(c) Figs $\{ \pi \times 1.5^2 \times 2 \}$ (= fig $\{ 9\pi/2 \}$ = fig 14.14)		M1		
Correct conversion, (using 1 000 000)	indep	M1		
Fig their 14.14 their 576	indep	M1		
24 500 to 24 600		A1	4	12

Page 7	Mark Scheme	Syllabus	Paper
	GCE O Level – November 2005	4024	2

10

(a) (i) $EF = x - 2$			
(ii) $BC = 100/x$			
(iii) $FG = [100/x] - 5$ or their (ii) $- 5$			
All three correct	B2	2	
After B0, allow B1 for any two correct answers			
(b) $y = (x - 2)(100 - 5x)$ convincingly leading to $y = 110 - 5x - \frac{200}{x}$ AG	B1	1	
(c) $40(,0)$	B1	1	
(d) All 7 points plotted (P1 for at least 5 of these)	P2		
Smooth curve, not grossly thick, through all plotted points, of which at least 5 are correct	C1	3	
(e) Drawing tangent at $x = 8$ and estimating <u>change in y</u> , ignoring sign change in x	M1		
$- 1.60$ to $- 2.00$ [Ignore support from Calculus]	A1	2	
(f) (i) 4.65 or 4.80 to 48.45 to 8.55	R2	2	
After R0, allow R1 for either value			
(ii) 6.20 to 6.40	X1	1	12

Page 8	Mark Scheme	Syllabus	Paper
	GCE O Level – November 2005	4024	2

11				
Accept such as $\vec{b} + -\vec{a}$ for $\vec{b} - \vec{a}$ throughout. Only expressions linear in $\vec{a}$ and/or $\vec{b}$ can score.				
(a) (i) $\vec{DO} = \vec{a}$	B1			
(ii) $\vec{AB} = \vec{b} - \vec{a}$	B1			
(iii) $\vec{DB} = \vec{a} + \vec{b}$	B1	3		
(b) Triangle OAB is equilateral, so length $OA = OB = AB$	B1	1		
(c) (i) (a) $\vec{AX} = \vec{b}$	B1			
(b) $\vec{YX} = 3\vec{b}$	B1	2		
(ii) Points lie on a straight line or	B1	1		
(d) $\vec{XZ} = -3\vec{a}$	B1	1		
(e) $\vec{YZ} = 3\vec{b} - 3\vec{a}$ or $\vec{ZY} = 3\vec{a} - 3\vec{b}$	B1			
Deduces $ \vec{XZ} = \vec{YX} = \vec{YZ} $, So sides are equal and hence triangle equilateral	dep B1	2		
Alternative: States XZ parallel OA and YX parallel OB so $\angle X = 60^\circ$ And length $XZ = \text{length } YX$ so equilateral	(B1) dep (B1)			
(f) $\frac{1}{9}$	M1			
After 0/2, allow B1 for 1 to 9, $1:9, 9, \left(\frac{1}{3}\right)^2$ or $\left(\frac{a}{3a}\right)^2$ seen	B2	2		12

MARK SCHEME for the October/November 2006 question paper

4024 MATHEMATICS

4024/02

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

The grade thresholds for various grades are published in the report on the examination for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the October/November 2006 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



Page 2	Mark Scheme	Syllabus	Paper
	GCE O LEVEL - OCT/NOV 2006	4024	02

1 (a) (i) $5(x+2)(x-2)$ seen	B2 2 2
After B0, allow B1 for partial factorisation, e.g. $5(x^2 - 4)$ or $(5x + 10)(x - 2)$ or $(x + 2)(x - 2)$ seen etc	
(ii) Final answer $\frac{x-2}{2(x-1)}$ oe including $\frac{x-2}{2x-2}$ asc	B2 2 2
After B0, allow B1 for $\frac{\text{Their (a)(i)}}{10(x-1)(x+2)}$ soi or $\frac{5x-10}{10x-10}$ oe nww or quadratic factors of denominator including $(x-1)(x+2)$	
(b) $\frac{4(y+5)-3(y-3)}{(y-3)(y+5)}$ oe soi	M1
If denominator in this form, inner brackets essential If not in this form, accept quadratic expression with y^2 and -15	
Final answer $\frac{y+29}{(y-3)(y+5)}$ oe	A2 3 2
After M1 A0, allow A1 for correct simplified numerator and denominator seen, not necessarily at the same stage	
(c) Final answer $(g^-) \frac{4\pi^2 L}{T^2}$ oe cao	B3
Correct final answer involving an expression divided by fraction or, in either order, Square their equation ft	SCB2 M1
and Clears fraction, $(gT^2 = 4\pi^2 L)$ ft	indep M1 3 3 10
2 (a) (i) Final answer (9 , 6) or $x = 9, y = 6$	B1 1 1
(ii) $\frac{3}{4}$ or $\frac{6}{8}$ or (0).75	B1 1 1
(iii) $(\pm) 10$	B1 1 1
(b) (i) Final answer $(-12, 2)$ or $x = -12, y = 2$ Condone brackets missing	B2 2 2
After B0, allow B1 for $\begin{pmatrix} -8 \\ 5 \end{pmatrix} + \begin{pmatrix} -4 \\ -3 \end{pmatrix}$ oe or $\begin{pmatrix} -12 \\ 2 \end{pmatrix}$	
(ii) Trapezium	indep B1 1 1 6

Page 3	Mark Scheme	Syllabus	Paper
	GCE O LEVEL - OCT/NOV 2006	4024	02

3

- (a) $91^2 = 53^2 + 64^2 + 2 \times 53 \times 64 \cos(P)$ oe soi M1
 $(\cos P =) \frac{53^2 + 64^2 - 91^2}{2 \times 53 \times 64}$ oe soi $(= \frac{-1376}{6784}) (= -0.2028)$ M1
 $(P =) 101.65^\circ$ to 101.75° A1 3 2
 If only one or both of other angles alone found,
 allow M1 for $53^2 = 64^2 + 91^2 + 2 \times 64 \times 91 \cos(Q)$ or $64^2 = 53^2 + 91^2 + 2 \times 53 \times 91 \cos(R)$
 and A1 for $(Q =) 34.75^\circ$ to 34.85° or $(R =) 43.45^\circ$ to 43.55°
 Long methods : Allow M2 A1
- (b) $\sin S = \frac{53 \sin 68}{74}$ $(= 0.66406)$ M1
 $S = 41.55^\circ$ to 41.65° A1
 $P = 70.35$ to 70.45° or $112 - \text{their } S$ ft (dep on M1) A1 3 2
 Long methods : Allow M2 A1
- (c) $\frac{1}{2} \times 53 \times 74 \sin(\text{their } P)$ M1
 1845 to $1855 \text{ (m}^2\text{)}$ cao A1 2 2 8

- 4 (a) $(XBY =) 150^\circ$ B1 1 1
 (b) $XAD = XBY (= 150)$ B1
 $XA = XB$ and $AD (= BC) = BY$ B1
 Conclusion drawn and at least one reason shown SAS needed if too many facts dep B1 3 -
- (c) $AXD = BXY$ soi B1
 Convincingly shows $DXY = 60^\circ (= AXB)$ AG dep B1 2 -
- (d) States $DX = XY$ B1
 Correctly concludes triangle DXY is equilateral dep B1 2 - 8
 or $DY = DX$ and/or XY with a reason B1
 triangle is equilateral dep B1
- (c)(d) together $\triangle DCY$ congruent to $\triangle ADX$ and/or $\triangle BXY$ B1
 $DY = DX$ and/or XY dep B1
 $\triangle DCY$ is equilateral dep B1
 Angle $DXY = 60^\circ$ dep B1
 Numerical values used for other angles cannot gain credit

Page 4	Mark Scheme	Syllabus	Paper
	GCE O LEVEL - OCT/NOV 2006	4024	02

5 (a) (i) (\$)	825	B1	1	1
(ii) (£)	625	B1	1	1
(iii)	$\frac{792 \times 1.44}{1.65}$	M1		
	691.2 (euros)	A1	2	2
(b) (i) (\$)	16 200	B1	1	1
(ii)	(Their 16 200) $\times 1.08 \times 1.08$ oe soi	M1		
	(\$)	18 895.68 [Accept 18 896, 18895.7, 18895 or 18900]	A1	2 2
(iii) Figures	$\frac{\text{Their (b)(ii)} - 15\,000}{15\,000} (\times 100)$ or $\frac{\text{Their } 1200 + 1296 + 1399.68}{15\,000}$	M1		
	25.95 to 26.05 (%) [Accept 26]	A1	2	2
	or 125.95 to 126.05 (%)	SC B1		
(c)	Use of $\frac{12 \text{ or } 100}{112}$ soi	M1		
	(\$)	41 500	A1	2 2 11

6 (a)	Formula For numerical $\frac{p \pm \sqrt{q}}{r}$, (not $\pm p$), seen or used,			
	Allow B1 for $p = -12$ and $r = 14$ and B1 for $q = 452$ or $\sqrt{q} = 21.2$..soi	B1 + B1		
	Complete square Allow B1 for $(a + 6/7)^2$ or $(a + 6/7)$ oe soi			
	and B1 for 113/49 or square roots such as 1.5185..or 10.63../7			
	Final answers Allow B1 for each of 0.66 and - 2.38 nww	B2	4	2
	or allow B1 for both 0.661. and -2.375.. seen or 0.66 and -2.38 seen			(1)
(b)				
(i)	$4x + 6y = 816$ seen (leading to $2x + 3y = 408$)	B1	1	-
(ii)	$3x + 5y = 654$ oe seen	B1	1	1
(iii)	$x = 78$ and $y = 84$	B3	3	3 9
	After B0, allow B2 for one correct answer found with no wrong working			
	After B0, allow M1 for correct method to eliminate one variable			
	After $5x + 3y = 654$ in (ii), allow SC B2 for both $x = 82$ and $y = 81.3$ or better			

Page 5	Mark Scheme	Syllabus	Paper
	GCE O LEVEL - OCT/NOV 2006	4024	02

7 (a)	$2\pi \times 30^2$	$(= 1800\pi)$	$(= 5655)$	soi		M1			
	$2\pi \times 30 \times 70$	$(= 4200\pi)$	$(= 13194)$	soi	indep	M1			
	Their $1800\pi + \text{their } 4200\pi + \pi \times 30^2$		(provided all areas)		indep	M1			
	21 650 to 21 750 (cm ²)					A1	4	3	
Note Use of $3\pi 30^2$ may be taken as $2\pi 30^2 + \pi 30^2$, unless contradicted by the addition of extra $\pi 30^2$, when M0, M1, M1, A0 possible									
(b) (i)	$\frac{2}{3}\pi \times 30^3$	$(= 18000\pi)$	$(= 56549)$			M1			
	Their $18000\pi + \pi \times 30^2 \times 70$	$(= 81\,000\pi)$	$(= 254469)$	(both volumes)	indep	M1			
	254 to 255 (litres)	cao				A1	3	2	
(ii)	$\frac{\text{Their (b)(i)}}{3}$	$(= 84.8..)$				M1			
	1 minute 24.5seconds to 1 minute 25.5 seconds	cao				A1	2	2	
(iii)	(Length =) Figures $\frac{\text{Their (b)(i)}}{[\frac{1}{2}(0.4 + 0.6) \times 0.3]}$					M1			
	Correct conversion of units (using 1000)				indep	M1			
	1.690 to 1.700 m or 169.0 to 170.0 cm [Unit essential in this case]	cao				A1	3	3	12

Page 6	Mark Scheme	Syllabus	Paper
	GCE O LEVEL - OCT/NOV 2006	4024	02

8 (a) (i) 21 , 28	B1 1 1
(ii) $\frac{1}{2} \times 7 \times (7 + 1) = 28$ (= T_7) or better seen	B1 1 -
(iii) 5050	B1 1 1
(iv) 25 250 or $5 \times$ their (iii) ft	B1 1 1
(v) Attempts to use T_{500} - their (iv) (provided their (iv) < their T_{500}) 100 000	M1 A1 2 1
(b) (i) $S_6 = 56$ $S_7 = 84$ After $B0 + B0$, allow M1 for correct expansion of either or both expressions	B1 B1 2 2
(ii) $(7 \times (7 + 1) \times (7 + 2)) \div 6 = 84$ (= S_7) or better seen	B1 1 -
(iii) 1540 seen	B1 1 1
(c) (i) $S_4 - S_3 = (1 \times 4 + 2 \times 3 + 3 \times 2 + 4 \times 1) - (1 \times 3 + 2 \times 2 + 3 \times 1)$ $= 4 + 3 + 2 + 1$ (= T_4) seen 20 - 10 = 10 is enough to score	B1 1 -
(ii) $S_{n+1} - S_n = (n + 1) + n + (n - 1) + \dots + 2 + 1 = T_{n+1}$ justified If algebraic methods used, mark strictly, expecting at least one step seen	B1 1 - 12

Page 7	Mark Scheme	Syllabus	Paper
	GCE O LEVEL - OCT/NOV 2006	4024	02

9

(a) $\sqrt{104^2 - 100^2}$ or 28.56... oe seen [leading to 28.6 AG] B1 1 -

(b) (i) 25° B1 1 1

(ii) (FN $\Rightarrow$) $100 \tan(\text{their } 25) (= 46.63\dots)$ M1

(FB $\Rightarrow$) Their $[46.63 - (28.56\dots \text{ or } 28.6)]$ dep M1

18.00 to 18.10 (m) [Expect at least 3 sig figs here] A1 3 3

Alternative methods : M2 A1

(c) (i) $CN = \sqrt{100^2 + 60^2}$ or $BC = \sqrt{104^2 + 60^2}$ M1

$= 116.6\dots$ soi or $= 120.06\dots$ soi A1

$\tan BCN = \frac{\text{Their } 28.6}{\text{Their } CN}$ or $\sin BCN = \frac{\text{Their } 28.6}{\text{Their } BC}$ M1

13.70° to 13.80° cao A1 4 3

Alternative methods : still M1 A1 M1 A1

(ii) $BD = \frac{(\text{Their } 28.6)}{\sin 10}$ (≈ 164 to 165) M1

$\cos DBA = \frac{104}{\text{Their } BD}$ ($\approx 0.63\dots$) dep M1

50.75° to 50.85° cao A1 3 2 12

or $DN = \frac{(\text{Their } 28.6)}{\tan 10}$ (≈ 162.198)

and $DA = \sqrt{(\text{their } 162.198^2 - 100^2)}$ (≈ 127.7) M1

$\tan DBA = \frac{\text{their } 127.7}{104}$ dep M1

50.75° to 50.85° A1

Alternative methods : M2 A1

Page 8	Mark Scheme	Syllabus	Paper
	GCE O LEVEL - OCT/NOV 2006	4024	02

10 Condone inaccuracies of up to 1 mm in plotting and drawing.

If plots are not visible, allow P marks if curve passes within 1 mm of correct plot.

Both P and dep C marks can be recovered following a grossly wrong plot if the plot is ignored and the curve passes within 1 mm of the correct point.

Lined or plain paper used : no penalty, but extend tolerances to 2 mm.

Penalties , only to be applied to any P or C marks earned :

Wrong scale(s) : - 1 once

Interchanged axes : no penalty if labelled, - 1 otherwise

Non-uniform scale(s) : - 2 after marking as generously as possible

- (a) 8(.03) B1 1 1
- Ignore graph for $x < 1$ and for $x > 6$ throughout rest of question
- (b) All 7 points plotted ft (P1 for at least 5 of these ft) P2
- Smooth curve, not grossly thick , through all plotted points, of which
at least 5 are correct C1 3 -
- (c)
- 1.35 to 1.45 B1
- 3.55 to 3.70 B1 2 2
- (d) Drawing tangent at $x = 4$ and estimating change in y
change in x M1
- 1.20 to 1.40 A1 2 -
- Accept integer if in range for A1
integer
- (e) (i) Ruled straight line within 1 mm of both (1 , 3.5) and (5 , 5.5) L2 2 -
- After L0, allow L1 for a good freehand line through these points,
or a ruled line that would pass within 1 mm of the points if longer,
or a ruled line that is long enough and passes within 2 mm of the points
- (ii)
- 1.45 to 1.55 and 4.55 to 4.65 X1 1 1
- (iii) $2x^3 - 5x^2 - 30x + 50$ (= 0) or any equivalent equation E1 1 1 12
- Accept $a = -5$, $b = -30$ and $c = 50$

MARK SCHEME for the October/November 2007 question paper

4024/02	4024 MATHEMATICS Paper 2, maximum raw mark 100
----------------	--

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the October/November 2007 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



Page 2	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2007	4024	02

Abbreviations

cao correct answer only

oe or equivalent

soi seen or implied

www without wrong working

Page 3	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2007	4024	02

Question Number		Sub (part) mark	Comments
1	(a) $\tan \widehat{CAB} = \frac{200}{65}$ oe $\widehat{CAB} = 72.(0)^\circ$ accept 71.95 to 72.05	M1 A1 (2)	Their 00 09 is whatever they think the time is, written in 24 hr. clock style. Expect these angles to be identified, possibly by the final answer. (Degree signs optional)
	(b) (i) Figs $\frac{750}{5}$ soi 0.15 h oe 23 05 or 22 56 + their 00 09 ✓	M1 A1 B1 (3)	
	(ii) $\cos \widehat{PRS} = \frac{300}{750}$ or $\sin \widehat{PSR} = \frac{300}{750}$ $\widehat{PRS} = 66.4^\circ$ or $\widehat{PSR} = 23.6^\circ$ (Bearing of S from R =) 113.6, accept 114, or 180 – their $\widehat{PRS}$ ✓ or 90 + their $\widehat{PSR}$ ✓	M1 A1 B1 (3)	
		(8)	
2	(a) (i) 2.71 After B0, 2.709..., or their 2.709.... correctly rounded, or 2.7(0) www B1	B2 (2)	e.g. $(\pm) \sqrt{(x-a)^2 - a^2}$
	(ii) Final ans (b=) $(\pm) \sqrt{x^2 - 2ax}$ oe After B0, $x - a = \sqrt{a^2 + b^2}$ soi M1	B3 M1	
	and $(x - a)^2 = a^2 + b^2$ further M1	(3)	
	(b) (i) $8x - 27$ oe After B0, $5x$ or $8x + k$ seen B1	B2 (2)	
	(ii) Their $8x - 27 < 300$ (provided it is an expression in x) $x < 40.875$ (accept 40.9 or 41) After M0, Final ans. 40.875 (accept 40.9 or 41) SC1	M1 A1 (2)	
	(iii) 40 or their (b)(ii) ✓ rounded down to the next whole number.	B1 ✓ (1) (10)	

Page 4	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2007	4024	02

Question Number		Sub (part) mark	Comments
3	(a) (i) 56	B1	
	(ii) 68 or $180 - 2 \times \text{their (i)}$ ✓	B1 ✓ (2)	
	(b) (i) $\widehat{WXV} = \widehat{YZZ}$ (vertically opposite) or $\widehat{VWX} = \widehat{XZY}$ ($WV \parallel YZ$) stated	B1	Reason not required for 1 st B1
	convincingly deduces triangles (VWX and YZX) are equiangular	B1 (2)	For the 2 nd B1 accept (i) 3 pairs of equal angles stated, with one of the above reasons given as appropriate. (ii) 2 pairs of equal angles, with reason and conclusion (iii) A solution using the ratios of corresponding sides, provided that the equal angle used is justified, and that similarity has not been assumed.
	(ii) $\frac{YZ}{25} = \frac{160}{40}$ oe soi (YZ =) 100 cao	M1 A1 (2) (6)	
4	(a) Final ans. \$ 13.44 or 1344 g	B1	
		(1)	
	(b) $\frac{35-28}{28} \times (100)$ oe	M1	
	25(%)	A1	
	After M0, use of figs $\frac{35}{28}$ soi	SC1	
		(2)	
	(c) 5(%)	B2	
	After B0 figs $\frac{35 \times 1200 - 399}{35 \times 1200}$ oe	M1	
		(2)	
	(d) (\$) 4	B3	
	After B0 ÷ by 115 × by 100	M1 M1	
	After B0, M0 115 seen	SC1	
		(3) (8)	

Page 5	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2007	4024	02

Question Number		Sub (part) mark	
5	Nonsense in one part may be used to earn M marks in any other part of the question. Throughout, accept equivalent complete methods and decimal angles without degree sign, but degree sign essential if answer in degrees and minutes. (a) (i) $(AD)^2 = 24^2 + 16^2 \pm 2 \times 24 \times 16 \cos 112$ soi $(AD) = \sqrt{24^2 + 16^2 - 2 \times 24 \times 16 \cos 112} (= \sqrt{1119.697...})$ $(AD) = 33.5$ (from 33.46..., accept 33.45 to 33.55) After A0 and at least M1, 1119.697... seen or $(AD) = 23.3$ (from $\sqrt{544.30...}$) A1 (anw 2) (4) (ii) $\frac{\sin(\widehat{BCD})}{16} = \frac{\sin(180-112)}{20}$ oe $\sin \widehat{BCD} = \frac{16 \sin(180-112)}{20} (=0.7417...)$ $\widehat{BCD} = 47.9$ (from 47.88...), accept 47.85 to 47.95 (anw 2) (3) (iii) $\frac{1}{2} \times 24 \times 16 \sin 112$ oe $= 178$ (cm²) (2) (b) 60 (k) cao B1 (1) (10)		

Page 6	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2007	4024	02

Question Number		Sub (part) mark	Comments
6	(a)(i) 6 (ii) (a) π (their 15)² 707 (cm²) accept 706.5 to 707.5 (b) $\frac{1}{6}(\pi 15^2 - 7\pi 5^2)$ oe or $\frac{1}{6}(\text{their}(a) - \text{their} 7\pi 5^2)$ or $\frac{\text{their } \widehat{AOB}}{360} \text{their } \pi 15^2 - \frac{\text{their } \widehat{AOB}}{360} \text{their } \pi 5^2 - \text{their } \pi 5^2$ = 26.2 (cm²) accept 26.15 to 26.25 (b) (i) 60(°) (ii) $\frac{\text{their}(i)}{360} \times 2\pi 5$ $\frac{\text{their}(i)}{360} \times 2\pi(\text{their} 15)$ $\frac{\text{their}(i)}{360} \times 2\pi 5 + \frac{\text{their}(i)}{360} \times 2\pi(\text{their} 15) + 2\pi 5$ oe indep = 52.4 (cm) (accept 52.35 to 52.45) After MO, 2π5 seen SC1 (answ 2)	B1 (1) M1 A1 (2) M1 A1 (2) B1 (1) M1 M1 M1 A1 SC1 (4) (10)	For diameter 5, only method marks are available throughout. Accept radian form Expressions may be constructed using radians. i.e. if no other marks are scored, a correct circumference of a small circle gets 1 mark.

Page 7	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2007	4024	02

Question Number		Sub (part) mark	Comments
7	(a)(i) $\frac{k}{3+2+1} \times 75$ $k = 1, 2$ or 3. = 25 (litres) (ii) e.g. 40, 35, 36 (cents/litre) seen Final ans. 25 (litre bag) (<i>ans 0</i>) (b)(i) $\frac{1}{3} \pi 10^2 \times 24$ soi - $\frac{1}{3} \pi 5^2 \times 12$ oe e.g. $\frac{7}{8} (\frac{1}{3} \pi 10^2 \times 24)$ a further 2199.1...or their <u>volume</u> in $\text{cm}^3 + 10^3$ indep 2.20 (litres) (accept 2.195 to 2.205) cao (<i>ans 3</i>) (ii) $\frac{75}{\text{their } b(i)}$ soi 34 or their (ii) rounded down $\checkmark$ (iii) Use of (ratio of vols. =) $10^3 : 5^3$ seen or use of $\frac{1}{3} \pi 5^2 \times 12 - \frac{1}{3} \pi 2.5^2 \times 6$ (= 274.89...) 272 or their (b)(ii) $\times 8 \checkmark$ or $\frac{75}{\text{their } 2.199} \times 8 \checkmark$ rounded down	M1 A1 (2) M1 A1 (2) M1 M1 M1 A1 (4) M1 A1 $\checkmark$ (2) M1 A1 $\checkmark$ (2) (12)	

Page 8	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2007	4024	02

Question Number		Sub (part) mark	Comments
8	Condone inaccuracies of up to 1 mm in plotting and drawing. If plots are not visible, allow P marks if curve passes within 1 mm of correct plot. Both P and dep C marks can be recovered following a grossly wrong plot if the plot is ignored and the curve passes within 1 mm of the correct point. Lined or plain paper used : no penalty, extend tolerances to 2 mm. <u>Penalties</u> deducted from P and C marks only: Wrong scale(s) –1 once. Interchanged axes : no penalty if labelled, -1 otherwise. Non-uniform scale : -2 after marking as generously as possible. (a) $(x =) 12$ or -2 After B0, correct factors of their quadratic or their $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ M1 (b)(i) All 6 given points plotted. 4 correct points P1 Smooth curve, not grossly thick, through all plotted points, dep on P1 C1 (ii) Curve drawn to (12,0) or $\surd$ from (a) D1 (iii) 45 (m) or 45 ± 0.5 if read from the graph. H1 (iv) Using $y = 30$ (e.g. 0.6 to 0.8 and/or 9.3 to 9.5 seen) (distance travelled =) 8.5 to 8.9 (m) M1 (c)(i) $(p =) 49$ A1 (ii)(a) 49 (m) cao B1 (b) 5 (m) cao B1	B1 B1 (2) P2 P1 C1 (3) D1 (1) H1 (1) M1 A1 (2) B1 B1 B1 (3) (12)	Ignore drawn to negative x Follow through only if the shape remains reasonably parabolic.

Page 9	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2007	4024	02

Question Number		Sub (part) mark	Comments
9	(a) $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$ (b)(i)(a) $-b$ (b) $2(b-a)$ or $2b-2a$ (c) $2a$ or their $(a)+3a+b-a$ ✓ (d) a or $-2b+3a$ + their (b) ✓ (ii)(a) Trapezium dep on the ans. a in (i)(d) Two sides $(AD, BC) \parallel$ also dep on the ans. a in (i)(d) (b) 1:2:3 cao independent (c) In this part give -1 once for omission of appropriate reason. (i) $(\hat{CEA}) = 146^\circ$: Angle in the same segment. (ii) $(\hat{CBA}) = 73^\circ$: Angle at the centre twice angle at circumf. (iii) $(\hat{CFA}) = 34^\circ$: Angles in opposite segments supplementary (iv) $(\hat{DCF}) = 73^\circ$ or $180 - (\text{their(ii)} + \text{their(iii)})$ ✓ Opposite angles in a cyclic quad and/or angle sum of a triangle. (ans 3)	B1 (1) B1 B1 B1 ✓ B1 ✓ (4) B1 B1 (2) B1 (1) B1 B1 B1 B1 ✓ (4) (12)	Must be simplified. Must be simplified

Page 10	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2007	4024	02

Question Number		Sub (part) mark	Comments
10	The general instructions given in Q8 apply here. (a)(i) $4 \times 75 + 56 \times 125 + 84 \times 175 + 76 \times 225 + 36 \times 275 + 4 \times 325$ condone consistent use of other value in each interval, and one error or omission 50300 (g) oe cao (ii) 193 (g) (accept 192.5 to 193.5) or their (i) $\div 260$ ✓ After M0 in (a), 50300 soi SC1 (b) (i) (0 4 60) 144 220 256 (260) (ii) All 7 points plotted ✓ 5 points plotted ✓ P1 Smooth curve, not grossly thick, through all plotted points, dep on P1 and ogive shape (iii)(a) 190.0 to 197.5 (g) clearly intended as the answer. (b) Intention to read graph at 65 and 195 e.g. 152.5 to 157.5 and 230 to 235 seen (I.Q. range =) 72.5 to 82.5 (g) (c) $260 - 144$ (table value) (= 116) 5 (sacks)	M1 A1 B1 ✓ (3) B1 (1) P2 ✓ C1 (3) B1 (1) M1 A1 (2) M1 A1 (2) (12)	E.g. if the answer only is given here, the mark is B1 + SC1.

Page 11	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2007	4024	02

Question Number		Sub (part) mark	Comments
11	(a)(i) $\sqrt{(2-4)^2 + (9-6)^2}$ oe 3.61 or better (3.605....)	M1 A1 (2)	
	(ii) $3x + 2y = 24$ or any 3 term equivalent After B0, $m = \frac{-3}{2}$ or $c = 12$ soi or their line through (2,9) or (4,6)	B2 B1	e.g. $y = -\frac{3}{2}x + 12$
	(b)(i) $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$	(2) B1	
	(ii) Reflection in the line $y = x$	(1) M1 A1	And no other transformation stated.
	(iii)(a) $\begin{pmatrix} -3 \\ -3 \end{pmatrix}$	(2) B1	
	(b) $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} h \\ k \end{pmatrix} + \begin{pmatrix} -3 \\ -3 \end{pmatrix}$ seen	(1) B1	dep on T1
	(c) $(h, k) = (-k - 3, h - 3)$ oe soi $h = 0$ and $k = -3$	(1) M1 A1	Method mark must be earned here.
	(d) $(0, -3)$ or (their h , their k) ✓	(2) B1 ✓ (1)	Allow either.
		(12)	

MARK SCHEME for the October/November 2008 question paper

4024/02	4024 MATHEMATICS Paper 2, maximum raw mark 100
----------------	--

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the October/November 2008 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



Page 2	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2008	4024	02

Question Number	Mark scheme details	Sub (part) mark	Comments
1	(a) (i) 16 cao (ii) (a) Figs $\frac{4}{91.8} \times (100)$ oe soi = 4.357..., 4.36 (%) After M0, 104.36 seen SC1 (b) Figs $\frac{19200}{21} \times 4 (= 36.57)$ oe Ans. (\$) 37 cao (iii) Figs $\frac{100}{90} \times 91.8$ 102 (cents) (b) (i) 13 500 (ii) 4 500 After B0, 240°, 36 000 or $2/3 + 1/4$soi B1	B1 [1] M1 A1 [2] M1 A1 [2] M1 A1 [2] B1 [1] B2 [2] [10]	E.g. 104.357 seen followed by ans 4%. Beware 4% from $(4 \div 95.8) \times 100 = 4.175$ Here and elsewhere, accept ans rounding to the given 3 sig. fig. ans. unless a particular range is specified. E.g. 914.28(95.8 – 91.8) Beware $1.04 \times$ total cost for 2006. Accept \$1.02
2	(a) (i) $\frac{5}{AB} = \cos 65$ oe soi ($AB =$) 11.83, 11.8(m) (ii) $\frac{1}{2} \times 10 \times 5 \times \tan 65$ oe 53.3 to 53.7 (iii) $4 \times$ their (a) (ii) + 100 313.2 to 314.5 or $4 \times$ their (a) (ii) + 100 ft (m²) After M0, 100 seen SC1 (b) (i) 140 (°) After B0, 90 or 220(°) soi B1 (ii) 40 or 180 – their (b) (i) (°) ft Use of Grads (a) (i) 9.57 (ii) 40.8 Rads: both ans. negative, therefore A0.	M1 A1 [2] M1 A1 [2] M1 A1ft [2] B2 [2] B1 ft [1] [9]	e.g. $\frac{\sin 65}{AB} = \frac{\sin 50}{10}$ e.g. $\frac{1}{2} \times$ their (a) (i) $\times 10 \times \sin 65$ or $\frac{1}{2} \times$ their (a) (i)² $\times \sin 50$ Accept 10² Dep. on 180 – their (b) (i) + ve.

Page 3	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2008	4024	02

3	(a) $(p =) -5$ After B0 $2(2p + 1) = k + 3(p - 3)$ soi M1 $4p + 2 = 6 + 3p - 9$ cao soi A1 p correctly evaluated ft A1ft	B3 [3]	Clear intention to deal correctly with the two fractions. Correct solution of their linear equation clear of brackets and fractions
	(b) Final ans. $\frac{2}{v+1}$ After B0, $2(v - 3)$ seen B1 $(v - 3)(v + 1)$ seen B1	B3 [3]	Not necessarily in the numerator Not necessarily in the denominator
	(c) (i) Equation $(10y + x) - (10x + y) = \pm 63$ seen +63 leading to $y - x = 7$ nww AG	M1 A1 [2]	
	(ii)(a) $(10x + y) + (10y + x) = 99$ seen leading to $x + y = 9$ nww AG	M1 [1]	
	(ii)(b) $x = 1$ $y = 8$ After B0, M1	B1 B1 [2]	Reaches such as $ky = 16$ or $hx = 2$.
		[11]	
4	(a) Histogram with Columns to 3 4 5 6 4 0.5 vertically and widths 5 5 5 5 20 at correct “heights”. After H0, at least 4 correct columns H2 at least 1 correct column H1 After 0, “correct” Histogram SC2 At least 4 “correct” cols. SC1	H3 [3]	Axes: ignore labels, but the vertical scale must give heights of 3, 4,..... No penalty for Histogram not our size. E.g. no vertical or horizontal scale, or the numbers are frequencies.
	(b) 5	B1 [1]	Accept 4
	(c) $\frac{1}{8}$ cao	C1 [1]	
	(d) $\frac{870}{14280}$ or $\frac{29k}{476k}$ or 0.061 After D0 $\frac{870}{14400}$ or $\frac{29k}{480k}$ or 0.0604. D1 or $\frac{30 \times 29}{120 \times 119}$ seen isw M1	D2 [2]	i.e. even if $\times 2$.
		[7]	

Page 4	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2008	4024	02

5	(a) (i) Angle between tangent and radius	B1 [1]	Must mention both tangent and radius.
	(ii) ($\hat{ROQ} =$) 140°	B1 [1]	
	(b) (i) ($\hat{AED} =$) 40°	B1 [1]	
	(ii) ($\hat{ROS} =$) 60° After B0, $\hat{DAE} = 80^\circ$	B2 [2]	
	(iii) ($BE =$) 11 (cm) or 10.84 after sine rule.	B2	
	After B0, $\frac{BE + 4}{17 + 3} = \frac{3}{4}$ oe M1	[2]	
		[7]	e.g. $\frac{BE + 4}{20} = \frac{\sin 40}{\sin 60}$
6	(a) (i) ($p =$) 19	B1 [1]	
	(ii) ($q =$) 29	B1 [1]	
	(b) (i) ($j =$) 16	B1 [1]	
	(ii) ($k =$) 25	B1 [1]	
	(iii) ($S_n =$) n^2	B1 [1]	
	(c) (i) 3, 4	B1 [1]	
	(ii) $n - 1$ cao	B1 [1]	
	(iii) $n^2 + n - 1$ oe or their (b) (iii) + (c) (ii) ft	B1 [1]	
		[8]	Accept their (a) (i) – (b) (i) ft and their (a) (ii) – (b) (ii) ft

Page 5	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2008	4024	02

7	(a) (i) $\frac{1080}{x}$ seen	B1 [1]	Their (a) (i) and (ii) must contain x. Their $\frac{1}{2}$ hr could be 30 (min). Ignore “rejected” at this stage. Accept ans. rounding to 240, –270, but nww
	(ii) $\frac{1080}{x+30}$ seen	B1 [1]	
	(b) their $\frac{1080}{x} - \text{their } \frac{1080}{x+30} = \pm \text{their } (\frac{1}{2} \text{ hr})$	M1	
	$\frac{1080}{x} - \frac{1080}{x+30} = \frac{1}{2}$ further	M1	
	leading to $x^2 + 30x - 64\,800 = 0$ nww AG	A1 [3]	
	(c) ($x =$) 240 and – 270	B4	
	After B0, one correct root	B3	
	Signs reversed with correct factors seen	SC2	
	Signs reversed	SC1	
	or for numerical $\frac{p \pm \sqrt{q}}{r}$ seen or used		
	$p = -30$ and $r = 2$	B1	
	$q = 260\,100$ or $\sqrt{q} = 510$	B1	
	or $(x + \frac{30}{2})^2$ seen	B1	
	65 025 or $(\pm)255$ seen	B1 [4]	
	(d) (i) $4\frac{1}{2}$ or $\frac{1080}{\text{their } (+ve)x}$ ft isw	B1 ft [1]	Ignore incorrect attempts to convert such as 4.5 hr to hr and min.
	(ii) $\frac{2 \times 1080}{84 + 4.5}$ or $\frac{2 \times 1080}{2 \times \text{their } (d)(i) - \frac{1}{2}}$	M1	
	254.1, 254 or $\frac{2 \times 1080}{2 \times \text{their } (d)(i) - \frac{1}{2}}$ (km/h)	A1 ft [2]	
		[12]	

Page 6	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2008	4024	02

8	Here and elsewhere in Trigonometry questions, nonsense in one part may be used to earn M marks in any other part of the question. Throughout, accept equivalent complete methods and decimal angles without degree sign, but degree sign essential if answer given in degrees and minutes. (a) (i) 15(°) cao (ii) $(AC^2 \Rightarrow) 15^2 + 10^2 \pm 2.15.10\cos 105$ $(AC \Rightarrow) \sqrt{15^2 + 10^2 - 2.15.10\cos 105}$ ($\sqrt{402.6}$) $(AC \Rightarrow) 20.06, 20.1$ (m) After A0, 402.6, 403 or 15.72 (from $\sqrt{247.35}$) (Alternative complete methods get M2 A2) (b) $\frac{\sin \hat{A}DB}{15} = \frac{\sin 105}{30}$ oe soi $\sin \hat{A}DB = \frac{15 \sin 105}{30}$ (= 0.4829) ($\hat{A}DB \Rightarrow$) 28.87, 28.9 (°) (c) (i) $BF^2 + 15^2 = 27^2$ soi ($EF \Rightarrow$) 10.05 to 10.20 (ii) $\sin \theta = \frac{15}{27}$ oe Final Ans 33.748, 33.7 (°) Grads (a) (ii) 18.7 (A2) 348.5 or 17.4 (A1) (b) 33.2 (from 0.4984) (c) (ii) 37.5 Rads (a) (ii) 19.9 397.3 or 15.9 (b) negative (A0) (c) (ii) 0.589	B1 [1] M1 M1 A2 A1 [4] M1 M1 A1 [3] M1 A1 [2] M1 A1 [2] [12]	NB. This M1 requires an attempt to evaluate the expression using the correct processes, followed by the intention to take the $\sqrt{\quad}$. +2.15.10cos105 has been used. e.g. $\sqrt{(10 \sin 75)^2 + (15 + 10 \sin 15)^2}$ e.g. by $\sqrt{27^2 - 15^2 - 20^2}$
---	--	--	--

Page 7	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2008	4024	02

9	(a) (i) $\pi a^2 - \pi b^2$	M1	With a = 30 or b = 10
	2510 cm ²	A1 [2]	(Accept answers correcting to 2510)
	(ii) Figs their 2513.27 × 200 (= 502654.82..)	M1	
	0.503, or $\frac{\text{their } 2513.27 \times 200}{10^6}$ ft (m ²)	A1ft [2]	
	(iii) Figs $\frac{\text{their(a)(ii)}}{150 \times 2}$ or Figs $\frac{\text{their(a)(i)}}{150 \times 100}$	M1	The volume version is shown in metres and the area version in cm. Figs allows the units to be inconsistent.
	1.676 or $\frac{\text{their(a)(ii)}}{150 \times 2} \times 10^3$	A1ft	
	or $\frac{\text{their(a)(i)}}{150 \times 100} \times 10$ ft (mm)	[2]	
	(b) (i) $2\pi \frac{3.5}{2}$ oe seen	M1	e.g. (curved SA of cone =) $\pi \times \frac{3.5}{2} \times 3$
	$\frac{\theta}{360} 2\pi 3$ oe seen	M1	e.g. (area of sector =) $\theta/(360) \times \pi \times 3^2$ Accept with $\theta = 210$.
	$2\pi \frac{3.5}{2} = \frac{\theta}{360} 2\pi 3$ oe leading to $\theta = 210$ AG	A1 [3]	Condone methods reaching the range 209.5 to 210.5
	(ii) $3\cos 75$ oe	M1	
	Their $(3\cos 75) + 3$ (= 3.776)	M1	This M is independent of the first.
	Final ans. 4	A1 [3]	
	(b) (ii) Grads 5 (from 4.148) Rads 6 (from 5.765)	[12]	

Page 8	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2008	4024	02

10	Condone inaccuracies of up to 1 mm in plotting and drawing. If plots are not visible, allow P marks if curve passes within 1 mm of correct plot. Both P and dependent C marks can be recovered following a grossly wrong plot if the plot is ignored and the curve passes within 1 mm of the correct point. Lined or plain paper used: no penalty, extend tolerances to 2 mm. <u>Penalties</u> deducted from P and C marks only: Wrong scale(s) –1 once Interchanged axes no penalty if labelled, –1 otherwise Non-uniform scale –2 after marking as generously as possible.			
	(a) All points plotted	P2		
	After P0, at least 4 correct plots	P1		
	Smooth curve, dep on at least	P1	C1 [3]	
	(b) 2200 to 2400	N1 [1]		
	(c) (i) Drawing tangent at $t = 2.5$ and $\frac{\Delta y}{\Delta x}$ seen	M1		
	1800 to 2800 (bacteria per hour)	A1 [2]		
	(ii) Rate of change (of number of bacteria per hour)	R1 [1]		Not just “increase”: need idea of rate. E.g. accept Speed bacteria produced, but not number of bacteria per hour.
	(d) (i) Ruled straight line (2,4500) to (3,3500) extended to cut the curve.	L2		
	After L0, freehand or shorter line	L1	[2]	
	(ii) 3.025 to 3.075 (hrs) or ft from their graph	T1ft [1]		Their line must be straight, but not horizontal.
	(e) (i) ($k =$) 50 cao	K1 [1]		Table value
	(ii) ($a =$) 4	E1 [1]		Accept $\frac{200}{\text{their } k}$
			[12]	

Page 9	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2008	4024	02

11	(a) (i) (a) 37	B1	[1]	Throughout this question, condone missing brackets if clear. In (a), condone fraction lines, but confusion between column vectors and coordinates is –1 once.
	(b) $\begin{pmatrix} 16 \\ -21 \end{pmatrix}$	B1	[1]	
	(ii) $(\overrightarrow{PT}) = \begin{pmatrix} 14 \\ -28 \end{pmatrix}$	B2		
	After B0, $\overrightarrow{QT} = \begin{pmatrix} 2 \\ 7 \end{pmatrix}$ soi M1		[2]	
	(iii) (–6, 51)	B2		eg $\overrightarrow{RS} = \begin{pmatrix} -12 \\ 35 \end{pmatrix}$ soi
	After B0, uses $\overrightarrow{RS} = \overrightarrow{QP}$ M1		[2]	
	(b) (i) 2 (units ²)	B1	[1]	
	(ii) (a) (–2, 3)	B1	[1]	
	(b) 32 (units ²) or 16 × their (b) (i) ft	B1	[1]	Accept such as $\frac{6}{3}$
	(iii) (a) (3, 1) After B0, shear factor 2	B2		
	or (h, 1) M1		[2]	
	(b) 2 (units ²) or their (b) (i) ft	B1	[1]	
			[12]	

**MARK SCHEME for the October/November 2010 question paper
for the guidance of teachers**

4024 MATHEMATICS (SYLLABUS D)

4024/21

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the October/November 2010 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2010	4024	21

Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
art	anything rounding to
soi	seen or implied

1	(a)	(i) -55	1	
		(ii) $(Q =) \frac{4}{7} (P - 15)$ oe	2	M1 for $\frac{7}{4} Q = P - 15$, or $4P = 7Q + 4 \times 15$ or better SC1 for $\frac{4P - 15}{7}$, $\frac{4(P + 15)}{7}$ or $4(\frac{P}{7} - 15)$ oe
		(b) (i) $7(c - 2d)(c + 2d)$	2	B1 for $7(c^2 - 4d^2)$ or $(7c + 14d)(c - 2d)$ or $(7c - 14d)(c + 2d)$ or $(c - 2d)(c + 2d)$ seen
		(ii) $(3x + 2)(x - 3)$	2	B1 for one correct factor seen or signs reversed
	(c)	6.2 oe	2	M1 for $4 = 5(7 - y)$ soi
	(a)	(i) 74.8 or 74.7	2	Here and elsewhere accept answers rounding to the given 3 significant figure answers. No obvious wrong working seen. M1 for $\tan BAC = \frac{180}{49}$ oe soi
		(ii) 15.2 or 90 – their (a)(i)	1ft	
		(b) (i) 500	2	M1 for $(LP^2 =) 1300^2 - 1200^2$ soi
	(ii)	293 cao	3	M1 for $\sin LPS = \frac{1200}{1300}$ or $\cos LSP = \frac{1200}{1300}$ or for correct use of their (b)(i) A1 for $LPS = 67.4$ cao or $LSP = 22.6$ cao B1 for $360 -$ their LPS or $270 +$ their LSP
		(iii) 9.75	2	M1 for figs $\frac{13}{1604 - 1556}$
3	(a)	(i) 38	1	
		(ii) 38	1ft	Their (i) (must be $< 90^\circ$)
		(iii) 74	1	
		(iv) 68	1ft	$180 -$ (their (iii) + their (i) or (ii)) or $106 -$ their (i) dep on positive ans.
	(b)	$(y =) \frac{1}{2}(90 - x)$ oe	3	B2 for $y + y + 90 + x = 180$ or better B1 for $ABO = y$ or $(OAC =) 90$

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2010	4024	21

4	(a)	(i) <i>P</i> correct (ii) All 10 elements correctly placed	1 3	In (a) ignore numbers outside the given range B1 for 21 correct B1 for at least two non-empty subsets correct (ignoring the position of 21) If 0 scored then allow SC2 if all the elements other than 21 are correctly placed.
	(b)	(i) 10 (ii) {b, c, d, f, g} (iii) 2 (iv) $\frac{3}{5}$ oe	1 1 1 1	
	(c)	(i) 3 (ii) 51	1 1	
5	(a)	25	1	B1 for $212.67 \times 36 (= 7656.12)$ B1 for $5280 \times \frac{x}{100}$ soi or their (b)(i)/5280 soi M1 for $5280 \times \frac{x}{100} \times 3 =$ their 2376.12 oe M2 for $\frac{30}{130} \times 7040$ oe M1 for $130\% = 7040$ soi
	(b)	(i) 2376.12 (ii) 15	2 3ft	
	(c)	1625 cao	3	
6	(a)	(i) 2.25 isw (ii) 2 www	2 1ft	M1 for $(1 \times 8 + 2 \times 17 + 3 \times 12 + 4 \times 3) \div 40$ B2 for 2 angles correct or 1 angle correct with all “correct” labels B1 for 1 angle correct with wrong or no labels or B1 for at least 2 angles calculated
	(b)	(i) Correct pie chart (ii) 6	3 1	
7	(a)	(i) 9.6 (ii) 16 cm (iii) 2 200 cm ² (iv) 191	1 2 2ft 3	M1 for $\frac{9600}{20 \times 30}$ B1 for areas 20×30 , their 16×20 and their 16×30 ft for $600 + 100 \times$ their (a)(ii) B1 for $\pi \times 0.8^2 \times 25$ soi M1 for their $(\pi \times 0.8^2 \times 25) \times t = 9600$ B1 for figs $\frac{25 \times 26}{2 \times 3}$ soi M1 for $\frac{3 \times 2.6}{4\pi}$
	(b)	(i) 11 or 10.8(3...) (ii) 0.853 cm	2 2	

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2010	4024	21

8	(a)	15, 8, 3, 0, -1, 0, 3, 8, 15	2	B1 for at least 7 correct
	(b)	All points plotted ft and curve drawn	3ft	P2 for 9 correct plots ft P1 for at least 5 correct ft and C1 for a smooth curve dependent on at least P1
	(c) (i)	Correct straight line	2	L1 for a correct but short line or with a correct section at least 6cm long but deviates elsewhere.
	(ii)	-1	2ft	M1 for $x = \frac{y+7}{2}$ soi or $3 = \frac{x+7}{2}$ ft from their line
9	(iii) (a)	-1.9 2.4	1ft	ft from their graphs
	(b)	$2x^2 - x - 9 (= 0)$	2	M1 for $\frac{y+7}{2} = x^2 - 1$ SC1 for $x^2 - 0.5x - 4.56$
	(a) (i)	26	1	
	(ii)	11.8	2	M1 for $\frac{BC}{\sin \text{their } 26} = \frac{15}{\sin 34}$
10	(b) (i)	104	4	M1 for $55^2 + 70^2 \pm 2 \times 55 \times 70 \cos 112$ M1 for $\sqrt{55^2 + 70^2 - 2 \times 55 \times 70 \cos 112}$ A1 for 10809(.4). or 71.0 SC2 for 104 anw
	(ii) (a)	11 14	1	
	(b)	71.4	2ft	M1 for $\frac{1}{2} \times 11 \times 14 \sin 112$ ft from their 11 and 14
	(c)	810	2	B1 for use of the factor with figs 25
	(a) (i)	$\begin{pmatrix} 14 \\ -4 \end{pmatrix}$	1	
	(ii)	14.6	2	M1 for $\sqrt{\text{their } 14^2 + \text{their } (-4)^2}$
	(iii)	Convincing demonstration	2	B1 for $\overrightarrow{EF} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ or $\overrightarrow{HG} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$
	(b)	Full description	3	B1 for enlargement B1 for centre (-2, 4) B1 for scale factor 2
	(c) (i)	(5, 0) (7,3) (2,3)	2	B1 for two correct or M1 for $\begin{pmatrix} 5 & 2 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$ seen
	(ii)	$\frac{1}{15} \begin{pmatrix} 3 & -2 \\ 0 & 5 \end{pmatrix}$	2	B1 for determinant 15 or $\frac{1}{15}$ seen or $\begin{pmatrix} 3 & -2 \\ 0 & 5 \end{pmatrix}$ seen Or M1 for $\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 5 & 7 & 2 \\ 0 & 3 & 3 \end{pmatrix} = \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2010	4024	21

11	(a) 3 : 1000 (b) (i) (a) 3 www (b) 487.5 (ii) (a) $x^2 + 34x - 225 = 0$ (b) 5.67 -39.67 (c) 44.0 cao	1 3 1ft 2 4 1ft	M1 for $27 \times 25 \times \frac{15}{10}$ A1 for 1012.5 SC1 for answer 3 anw ft their (a) $\times 500$ – their 1012.5 M1 for $(27 + 3x)(25 + x) = 2 \times 27 \times 25$ oe B1 for $p = -34$ and $r = 2$ B1 for $q = 2056$ or $\sqrt{q} = 45.3(4\dots)$ or B1 for $(x + 17)^{(2)}$ B1 for 22.67 or 514 B1 for one correct final answer or both 5.671... and -39.671....seen (possibly with no working) or both 5.7 and -39.7 SC1 + 1 for 5.67 and -39.67 anw ft $27 + 3 \times$ their +ive x but lost if negative value given as well
-----------	---	---	--

**MARK SCHEME for the October/November 2010 question paper
for the guidance of teachers**

4024 MATHEMATICS (SYLLABUS D)

4024/22

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the October/November 2010 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2010	4024	22

Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
art	anything rounding to
soi	seen or implied

1	(a)	(i) $\frac{1}{8}$ Final ans	1	
		(ii) $5 - 2x$ Final ans	2	B1 for $3x^2 - 2x - 3x^2 \pm 5$ or better soi
	(b)	17	2	M1 for $3t - 4 = 7 + 2t + 6$ or better
	(c)	$(5p - 7q)(x + 2y)$	2	B1 for $(5p \pm 7q)(x \pm 2y)$ or M1 for $5p(x + 2y) - 7q(x + 2y)$ or $x(5p - 7q) + 2y(5p - 7q)$ or B1 for the correct extraction of one common factor at any stage
	(d)	(i) $2 - x$ has the greater value (ii) $x < -0.5$ Final ans	2 2	B1 for $3x + 4 = -2$ or $2 - x = 4$ seen B1 for $3x + x, 2 - 4$ oe
2	(a)	(i) (\$) 935	1	
		(ii) (€) 600	1	
		(iii) (€) 550	2	M1 for Figs $85 \times \frac{121}{187}$
	(b)	(Rs) 51.95	2	M1 for Figs $\frac{4}{77}$
	(c)	(i) (\$) 375	1	
		(ii) (\$) 1087.5(0)	3	B1 for $\frac{15}{100} \times 27\,000$ (= 4050) soi or M1 for $\frac{1}{36}$ (their total interest + 27 000)

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2010	4024	22

3	(a)	144	2	B1 for $\frac{360}{10}$ or $(10 - 2)180$ or 10×180 oe seen
	(b)	38	3	B2 for all angles by symmetry or B1 for any angle deduced by symmetry M1 for such as $x + \text{their } AHC + \text{their } HCB + 80 = 360$ oe
	(c)	(i) $\frac{1}{2}(12 + 10)h$ or better	2	B1 for $NY = h$ used as height soi or for $\frac{1}{2}(10 + 12)$ seen
		(ii) 13	2ft	$\frac{221}{k+6}$ ft dependent on their (c)(i) = kh or M1 for their (c)(i) + their triangle = 221 or B1 for $\frac{1}{2} \times 12 \times h$
4	(a)	(i) 52.1	2	Here and elsewhere accept answers rounding to the given 3 significant figure answers. M1 for $\tan SPQ = \frac{9}{7}$ oe
		(ii) 7.37	2	M1 for $\frac{RS}{9} = \cos 35$ oe
	(b)	147 isw	3	M1 for $\frac{4}{l} = \sin 20$ oe and A1 for 11.69(5...) or B1 for $4\pi \times \text{their } l$
5	(a)	$90 < m < 95$	1	
	(b)	$93.2(0), 93 \frac{7}{36}$	3	B1 for $10 \times 70 + 16 \times 85 + 20 \times 92.5 + 21 \times 97.5 + 22 \times 105 + 1 \times 120$ and B1 for $\div$ by $10 + 16 + 20 + 21 + 22 + 1$
	(c)	(i) 4	1	
		(ii) 1 10	2	B1 for either
6	(a)	(i) Length of line AB 14 cm	1	
		(ii) (a) Perpendicular bisector of AB	1	(a) and (b) long enough to be convincing loci
		(b) Circular arc, centre B , radius 9 cm	1	
	(b)	Correct region shaded ft	1ft	
	(c)	(i) S_1 S_2 correctly marked ft	2ft	B1 for either or SC1 for S_1, S_2 on correct bearing from A
		(ii) 10°	1	
		(iii) 336°	1	

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2010	4024	22

7	(a)	(i) $\frac{13}{x}$	1	
		(ii) $\frac{13}{x+5}$	1	After 0 + 0, SC1 for AB and PQ implicit
		(b) $3x^2 + 15x - 65$	3	M2 for $\frac{13}{x} - \frac{13}{x+5} = 3$ or M1 for their (i) – their (ii) = ± 3
		(c) 2.78 -7.78	4	B1 for $p = -15$ and $r = 6$ and B1 for $q = 1005$ or $\sqrt{q} = 31.7...$ or B1 for $(x + \frac{5}{2})^{(2)}$ and B1 for $\frac{335}{12}$ or 5.28 and B1 for one correct final ans or both 2.783 and -7.783 or both 2.8, -7.8 SC1 + 1 for 2.78 and -7.78 anw.
		(d) (i) Accept any correct numerical expression (ii) $(\pm)4$	1 2	M1 for their 18.9 – 14.9
8	(a)	6.9	1	
	(b)	6 points ft plotted and joined.	3	P2 for 6 correct plots ft or P1 for at least 4 correct plots and dependent C1 for a smooth curve
	(c)	2.5 ft	1	
	(d)	(i) 0.4	1	
		(ii) Tangent drawn parallel to the chord.	1	
	(e)	(i) Correct straight line	2	L1 for good freehand or a potential L2 that has been spoilt.
		(ii) 3.5 ft	1	
		(iii) $A = 5$ $B = -60$ soi	2	B1 for one correct www or M1 for $\frac{x^3}{10} - \frac{x}{2} = -x + 6$ or better seen

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2010	4024	22

9	(a)	5	1	
	(b)	(i) 20.8, $20\frac{5}{6}$	2	B1 for $\frac{1}{2} \times 5 \times 5$
		(ii) 21.6	3	M2 for $\frac{1}{2}$ their $(\sqrt{5^2 + 5^2})^2 \sin 60$ or B1 for $x^2 = 5^2 + 5^2$ oe or M1 for $\frac{1}{2} \times$ their $x^2 \times \sin 60$
		(iii) 2.89 (cm) ft	3ft	ft for $(3 \times$ their (i)) $\div$ their (ii) evaluated or M2 for $h = \frac{3 \times \text{their (i)}}{\text{their (ii)}}$ or M1 for $\frac{1}{3} \times$ their (ii) $\times h =$ their (i)
	(c)	(i) 14	1	
		(ii) 24	1	
		(iii) 36	1	
	10	(a)	(i) Complete description	3
	(ii) Equal and parallel	1		
	(b)	(i) $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$	1	
		(ii) (0,0) (2,0) (0,1)	2	B1 for two correct
		(iii) (2,3), (4,3) (2,4) ft	1ft	ft from (ii) and / or (i)
		(iv) (a) $\begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix}$	2	B1 for either column correct or M1 for $\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 0 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$
	(b) Complete description	2	B1 for Stretching B1 for 2 units in <i>x</i> direction and 3 units in <i>y</i> direction	
11	(a)	19.6	4	M1 for $17^2 + 4^2 \pm 2 \times 17 \times 4 \cos 125$ soi M1 for $\sqrt{17^2 + 4^2 - 2 \times 17 \times 4 \cos 125}$ A1 for 383.0... seen or 15.1
	(b)	(i) 3 900 or 3.9 km	3	M1 for $\frac{PX}{4} = \tan 44$ oe A1 for 3.86(27) (km)
		(ii) (a) 14 21	2	B1 for 42 (mins) or 14 23 and 54 (secs) seen or M1 for 15 03 – 39 min 6 sec soi
		(b) 352	3	M2 for $\frac{17}{\text{their } 2.9} \times 60$ M1 for $\frac{17}{\text{their } 2.9}$

**MARK SCHEME for the October/November 2011 question paper
for the guidance of teachers**

4024 MATHEMATICS (SYLLABUS D)

4024/21

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2011	4024	21

Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
soi	seen or implied

Qu	Answers	Mark	Part marks
1	(a) 3.64	2	M1 for $10\tan 20^\circ$ oe
	(b) 8.24 – 8.28	2ft	M1 for $10(\tan 50^\circ - \tan 20^\circ)$ oe
	(c) 24.2, 24.3	3ft	M1 for $(PC =) \frac{10}{\cos 20^\circ}$ oe (= 10.64) and M1 for their (a) + 10 + their <i>PC</i>
2	(a) 0 $-7/3$ oe isw	2	B1 for one correct
	(b) $x = 1$ $y = -1/2$ oe	3	B2 for one correct www or M1 for reaching such as $hx = 11$, $11x = k$, or $py = -22$, $44y = q$
	(c) $\frac{6p+23}{(p-2)(2p+3)}$ final Ans	3	M1 for $\frac{5(2p+3)-4(p-2)}{(p-2)(2p+3)}$ soi and A1 for numerator $10p+15-4p+8$, condoning one sign error, and correct denominator seen at some stage
	(d) $\frac{q+1}{2q-1}$ final Ans	3	B1 for $(q-1)(q+1)$ seen and B1 for $(2q-1)(q-1)$ seen
3	(a) 60 alternate angles	1	
	(b) (i) 130	1	
	(ii) 310	1	
	(iii) 250	1ft	ft $360 - (\text{their (a)} + 50)$ or their (b)(ii) – their (a)
	(c) (i) Triangles equiangular	1	
	(ii) 51	3	M2 for $\frac{TQ}{85-TQ} = \frac{3}{2}$ oe or M1 for $\frac{TQ}{TR} = \frac{3}{2}$ oe

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2011	4024	21

4	(a) (i) $\frac{1}{5}$ oe (ii) 1 oe (b) (i) Correct completion (ii) (a) 0 (b) $\frac{6}{25}$ oe (c) $\frac{1}{25}$	1 1 2 1ft 1ft 2	B1 after up to 3 errors ft from their table Both fts dep on at least B1 scored in (b)(i) B1 for $5 \times 5 \times 5$ soi
5	(a) Convincing explanation (b) (i) $4(\pi)$ (ii) $\frac{3}{4}$ (c) (i) 75.4 (ii) 45.7	1 1 2ft 2 3	B1 for 3π M1 for $\frac{60}{360} \times \pi \times (\text{their } r)^2$ M1 for $\frac{1}{2} \times 6 \times 6 \times \sin 60$ or $\frac{1}{2} \times \pi \times 3 \times 3$ and M1 for their 75.4 – their $\frac{1}{2} \times 6 \times 6 \times \sin 60$ – their $\frac{1}{2} \times \pi \times 3 \times 3$ evaluated
6	(a) (i) 3 : 5 (ii) 9 600 (iii) 20 000 (b) (i) 252.48 (ii) 110.8(0) (iii) 33.4	1 1 2 1 2 2	M1 for ÷ figs 1125 oe M1 for $395 + kx = 3054.20$ soi M1 for ÷ figs 2395 soi
7	(a) (i) Congruency case complete www (ii) (a) $\frac{16}{25}$ oe (b) $\frac{3}{25}$ oe	3 1 1	D1 for common angle of 60 and S1 for $AP=BQ=CR$ or $AR=BP=CQ$

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2011	4024	21

	(b) (i) Angle in a semicircle oe (ii) Equal arcs or equal chords subtend equal angles at the circumference (iii) (a) 45 (b) 135 (iv) 98	1 2 1 1ft 2	B1 for $AB = BC$ ft $3 \times$ their (a) B1 for an angle correctly identified as 37°, 53° or 127°
8	(a) 8 correct plots joined (b) 5.5 – 7.5 (c) (i) Correct line (ii) 1.3 (iii) $B = 4$ $C = 5$ (d) (i) Convincing demonstration (ii) Correct completion of graph	2 2 2 1ft 3 1 1	P1 for at least 5 correct plots joined M1 for a correct tangent L1 for correct freehand line or a ruled line with gradient – 1 or intercept 2 B2 for one correct www or M1 for $2x - \frac{5}{2x} = 2 - x$ soi
9	(a) 122 working seen www (b) (i) Correct equation derived www (ii) 4.276 and –9.276 final answer	4 3 4	M1 for $\frac{\sin ABC}{11} = \frac{\sin 25}{5.5}$ and further M1 for $\sin ABC = \frac{11 \sin 25}{5.5}$ soi and A1 for 58 or B1 for $180 -$ their 58 M2 for $(12^2) = x^2 + (5 + x)^2 - 2x(5 + x)\cos 120$ or M1 for $(12^2) = x^2 + (5 + x)^2 + 2x(5 + x)\cos 120$ B3 for one correct or both not or wrongly corrected or B1 for $p = -15$ and $r = 6$ and B1 for $q = 1653$ or $\sqrt{q} = 40.657..$ or B1 for $\left(x + \frac{5}{2}\right)^{(2)}$ and B1 for $\frac{551}{12} = 45.916$ or 6.776

Page 5	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2011	4024	21

	(iii) 93	1ft	ft from their positive root in (ii)
10	(a) Correct histogram	3	H2 for at least 4 correct columns or H1 for 1 correct column For wrong or no vertical scale award SC2 for all heights correct and all widths correct SC1 for all heights correct or all widths correct
	(b) (i) 35 65 100 128	1	
	(ii) Correct curve	3	P2 for 7 correct ft plots or PC2 for 4 correct ft plots and curve or P1 for 4 correct ft plots
	(c) (i) (51)	1ft	
	(ii) (10)	2ft	B1 for reading from the graph at 105
	(d) (16.5)	2ft	B1 for reading from the graph at 30
11	(a) (i) (a) (–2,3)	1	B1 for one coordinate correct
	(b) (–3,2)	1ft	
	(c) (–3,2)	2	
	(ii) (a) $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$	1	
	(b) M_y	1	
	(b) (i) 5	1	B1 for $\sqrt{(4-7)^2 + (4-8)^2}$
	(ii) 5	2	
	(iii) (a) (0, 2)	2	
	(b) 307	1	M1 for appropriate perpendicular bisectors

**MARK SCHEME for the October/November 2011 question paper
for the guidance of teachers**

4024 MATHEMATICS (SYLLABUS D)

4024/22

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.



Page 2	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2011	4024	22

Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
soi	seen or implied

Qu	Answers	Mark	Part Marks
1	(a) $(m =) \frac{A - h^2}{4h}$ final ans	3	M1 for $A = 4hm + h^2$ or $\frac{A}{h} = 4m + h$ and (indep.) M1 for $4hm = A - h^2$ or $4m = \frac{A}{h} - h$ or for isolating the term in m after the first M0 .
	(b) $(x - 2y)(3a + 5b)$	2	M1 for $x(3a + 5b) - 2y(3a + 5b)$ or $3a(x - 2y) + 5b(x - 2y)$ or for correct extraction of one common factor at any stage.
	(c) 2 or – 1.6	3	C2 for one correct www or M2 for $5x - 1 = \pm 9$ or $5(5x + 8)(x - 2) = 0$ oe or M1 for $(5x - 1)^2 = 81$ soi or for $5x - 1 = 9$
2	(a) 43(.0)	2	M1 for $\sin x = \frac{3.73}{5.47}$ (0.6819) oe
	(b) $(\pm) 2.5(0)$	4	M2 for $5.32^2 + 3.73^2 - 2 \times 5.32 \times 3.73 \times \cos 25$ or M1 for $\cos 25 = \frac{3.73^2 + 5.32^2 - x^2}{2 \times 3.73 \times 5.32}$ or for $5.32^2 + 3.73^2 + 2 \times 5.32 \times 3.73 \times \cos 25$ A1 for 6.246 seen or 8.84
	(c) (i) 245	1	
	(ii) 16.7	2	B1 for $\tan y = \frac{30}{100}$ or $\frac{100}{30}$ ($y = 73.3$)
3	(a) (i) One line of symmetry	1	
	(ii) 10 : 1	3	B1 for $\pi (r \text{ or } R)^2$ and a further B1 for a valid attempt at an expression or equation involving R and r

Page 3	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2011	4024	22

	(b) (i) Convincing explanation	2	B1 for $AOB = 72$ soi or B1 for $ACB = 108$ and conclusion involving 360
	(ii) $7(\pi r)$	2	M1 for $(5 \times) \frac{252}{360} \times 2\pi r$
4	(a) (i) (a) 20	1	
	(b) 25	2	M1 for figs $\frac{60 \times their12 - 540}{60 \times their12}$ oe
	(ii) 6.25	2	B1 for $\div$ by figs 16
	(b) (i) $63 \times 6 + 4x \leq 500$ or $63 + x \leq 100$ oe isw	1	
	(ii) 93	2	M1 for $63 \times 6 + 4x (<) 500$ or better seen SC1 for answer 30.
	(c) (i) 435	1	
	(ii) 7.2(0)	2	M1 for $\div$ by figs 145
5	(a) $x = 5$ $y = 4$	2	B1 for one correct www or M1 for $\begin{pmatrix} 3x - 11 \\ x + y \end{pmatrix}$ soi
	(b) (i) (a) (a, c)	1	
	(b) (b, d)	1	
	(ii) $\begin{pmatrix} 1 & -3 \\ 3 & -2 \end{pmatrix}$	1	
	(iii) Reflection in x -axis	2	B1 for Reflection only.
6	(a) $\begin{pmatrix} 6 \\ 2 \end{pmatrix}$	1	
	(b) $\frac{1}{3}$ oe isw	1	
	(c) $P = -3$ $Q = 21$	2	M1 for $7P + Q = 0$ or $9P + Q = -6$ or B1 for an equation with $m =$ their (b) or $c = 7$
	(d) (i) $(18, -5)$	1	
	(ii) $(\pm) 13$	1	

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2011	4024	22

	(iii) (a) (12, 11)	2	B1 for $(x =) 12$
	(b) $2\overrightarrow{AB}$	1	
7	(a) (i) 27.7	2	M1 for $\frac{1}{2} \times 8 \times 8 \times \sin(\text{their } 60)$ oe
	(ii) Convincing explanation	1	
	(iii) 4.62	2	M1 for $\frac{AF}{\sin 30} = \frac{8}{\sin 120}$ oe such as $\frac{4}{AF} = \cos 30$
	(b) (i) 111	1ft	Accept $4 \times$ their (a)(i) ft
	(ii) 60.3	3ft	M1 for $(VF^2 =) 8^2 - (\text{their (a)(iii)})^2$ A1 for $(VF =) 6.53$ or ft soi SC1 for $\frac{1}{3} \times$ their (a)(i) $\times$ their VF
	(c) (i) 2 ± 0.01	2	M1 for $\sqrt[3]{}$ of ratio of their volumes soi
	(ii) 8	1	
8	(a) (i) 1240	1	
	(ii) 11 correct plots (and smooth curve)	2	P1 for 7 correct plots (joined.)
	(iii) (4.6)	1ft	ft from their graph at $y = 42$
	(b) (i) 1100	1	
	(ii) Correct line, ruled	2	L1 for freehand line or line with intercept 25 or gradient 3.75
	(c) (4.8)	1ft	
	(d) (i) $6 \leq \text{gradient} \leq 7$ (\$/yr)	2	M1 for correct tangent
	(ii) 3.75 (\$/yr)	1	
	(iii) (2)	1ft	
9	(a) Complete congruency case www	3	R1 for $A = B$ ($= 90$) S1 for $AP = BQ$ or $AB = BC$ <u>stated</u>
	(b) Convincing explanation www	2	C1 for stating $ABP = BCQ$
	(c) (i) Angle in a semicircle	1	
	(ii) B 2	1	

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	GCE O LEVEL – October/November 2011	4024	22

	(b) (i) Completion of diagram	2	B1 for two correct probabilities
	(ii) (a) $\frac{1}{11}$	1	
	(b) $\frac{k10}{k11}$ isw	2	B1 for two of the following products correct $\frac{8}{12} \times \frac{7}{11} + \frac{8}{12} \times \frac{4}{11} + \frac{4}{12} \times \frac{8}{11}$
	(iii) $\frac{k}{55k}$ isw	1	

MARK SCHEME for the October/November 2012 series

4024 MATHEMATICS (SYLLABUS D)

4024/21

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

Page 2	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2012	4024	21

Qu	Answers	Mark	Part Marks
1	(a) 4.28	2	M1 for $PQ = 4.5\cos 18^\circ$ oe
	(b) (i) 36 (.0)	2	M1 for $\sin \hat{ABC} = \frac{6}{10.2}$ oe
	(ii) 5.68 or 5.69	4ft	M3 for $\sqrt{14.3^2 - (10.2^2 - 6^2)} - 6$ oe or M2 for a complete method for CD or M1 for $BC^2 = 10.2^2 - 6^2$ or $DC^2 = 14.3^2 -$ their BC^2 oe SC1 for their CD – 6
2	(a) (i) $10p + 1$	2	B1 for $5p - 1 + 5p + 2$
	(ii) $x < -1$	2	B1 for $-2x, 5 - 3$ oe correctly isolated.
	(b) (i) 3	1	SC 2 for $\frac{A}{y+2}$ or $\frac{A}{2-y}$
	(ii) $(x =) \frac{A}{y-2}$	3	M2 for $\frac{A}{x} = y - 2$ or $yx - 2x = A$ or M1 for $y = \frac{A}{x} + 2$ or $yx = A + 2x$.
	(c) (i) $y = 6x - 5$ correctly derived	1	
	(ii) $y = 2x + 19$ correctly derived	1	
3	(a) (i) 30	1	
	(ii) 29 (.0)	3ft	SC 2 for the answer 51.7 or 51.8 or For the answer 129 M2 for Figs $\frac{(200 - a(i)) - 131.8}{131.8}$ or M1 for $200 - a(i)$ or for Figs $\frac{200 - 131.8}{131.8}$
	(b) 950	3	M2 for $x - \frac{15}{100} \times -647.5 = 160$ oe or B1 for 807.50 soi and B1 for division by 85.

Page 3	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2012	4024	21

4	(a) (i) 20°	1	B1 for Rectangle stated B1 for establishing a right angle using 20° and 70° B1 for 3 right angles stated.
	(ii) 70°	1	
	(iii) Rectangle stated and justified	3	
	(b) (i) Similar triangles established	2	
	(ii) 1.8	1	
5	(a) 15.7	1	M2 for $\frac{1}{2}\pi r^2 - (d)(i)$ or M1 for area of a circle πr^2 soi
	(b) 25.7	1ft	
	(c) (i) Correct 4 lines drawn	1	
	(ii) 4	1	
	(d) (i) 25	1	
	(ii) 14.3	3ft	
6	(a) 98.2	3	B1 for $4 \times 70 + 10 \times 85 + 14 \times 92.5 + 20 \times 97.5 + 24 \times 105 + 8 \times 120$ and B1 for division by $4+10+14+20+24+8$
	(b) (i) $\frac{28}{80}$ oe	1ft	
	(ii) $\frac{992}{6320}$ oe	2ft	
	(c) Correct histogram	3	

Page 4	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2012	4024	21

7	(a) 130 g tin (b) (i) 423 to 424 (ii) 319 (iii) 1050 (c) 7.2	2 2 3 2ft 3	B1 for one correct rate such as 1.3 (g/cen)t or 0.769 (cent/g) seen. M1 for $\pi \times r^2 \times 11$. M2 for $2\pi r^2 + 2\pi r11$ or M1 for either of these M1 for Figs (their 319 + 30)×3 B1 for $\div 10^4$ M2 for $\frac{x}{9} = \sqrt[3]{\frac{512}{1000}}$ oe or B1 for $\sqrt[3]{512} : \sqrt[3]{1000}$ soi
8	(a) 4.1 (b) Correct plots and curve. (c) a ft 1 cao b ft (d) 1 to 2	1 3 2ft 2	P2 for 7 or 8 correct plots ft or P1 for at least 4 correct plots ft and (dep) C1 for a smooth curve through all plotted points B1 for at least one solution B1 for the correct tangent drawn
	(e) (i) -1 (ii) -1 1 2	1 3ft	B2 for at least one ft and line drawn or M1 for their $y = x + a$ drawn. SC1 for all three found by solving the equation

Page 5	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2012	4024	21

9	(a) 59.2	3	M2 for $(AB =) \frac{65 \sin 60}{\sin(180 - (60 + 48))}$ or M1 for $\frac{AB}{\sin 60} = \frac{65}{\sin(180 - (60 + 48))}$ oe
	(b) 2360	2	M1 for $\frac{1}{2} \times 84 \times 65 \sin((180 -) 60)$
	(c) 129	4	M3 for $\sqrt{84^2 + 65^2 - 2 \times 84 \times 65 \cos(180 - 60)}$ or M2 for $84^2 + 65^2 - 2 \times 84 \times 65 \cos(180 - 60)$ or M1 for $84^2 + 65^2 + 2 \times 84 \times 65 \cos(180 - 60)$ and a dep A1 for 76.3
	(d) 31.9°	3	M2 for $\tan^{-1} \frac{35}{65 \sin 60}$ oe or M1 for $\tan^{-1} \frac{35}{d}$ or $\frac{d}{35}$ and B1 for for 65sin60 (= 56.3)

Page 6	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2012	4024	21

10	(a) $\frac{320}{x}$ oe isw	1	
	(b) $\frac{320}{x-80}$ isw	2	B1 for $x - 80$ seen
	(c) $x^2 - 80x - 10240 = 0$ correctly obtained	3	M2 for $\frac{320}{x-80} - \frac{320}{x} = \frac{5}{2}$ oe M1 for (a) – (b) = $\pm$ their $2\frac{1}{2}$
	(d) $148.8 - 68.8$	4	B1 for $\sqrt{(-80)^2 - 4 \times 1 \times (-10240)}$ soi and B1 for $\frac{-(-80) \pm \sqrt{\text{their } 47360}}{2 \times 1}$ soi and After B0B1 , allow SC1 for a correct ft. or B2 for 148.8 and -68.8 Final answer or B1 for one correct solution seen or 148.81. and -68.81 or 149 and -69 .
	(e) 2 h 9 mins	2ft	B1 for 2.15
11	(a) (i) (a) $\frac{1}{2}\mathbf{p} + \frac{1}{2}\mathbf{r}$	1	
	(b) $\mathbf{r} + \mathbf{p} - \mathbf{q}$	1	
	(c) $\frac{1}{2}\mathbf{p} + \frac{1}{2}\mathbf{r}$	2ft	B1 for unsimplified
	(ii) Equal and Parallel	1	
	(b) (i) Correct triangle	2	B1 for two correct vertices or triangle correct size and orientation
	(ii) Correct triangle	2	B1 for two correct vertices or triangle correct size and orientation
	(iii) Complete description www	3	B1 for Rotation B1 for either 90 anticlockwise or centre (0,3)

MARK SCHEME for the October/November 2012 series

4024 MATHEMATICS (SYLLABUS D)

4024/22

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

Page 2	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2012	4024	22

Qu	Answers	Mar k	Part Marks
1	(a) $57(.0^\circ)$ (b) (i) 5 m 6 cm cao (ii) 66.6 or 66.7 ($^\circ$)	2 3 2ft	M1 for $\tan \hat{A}CB = \frac{10}{6.5}$ oe B2 for $(BD =) 15.1$ or better or M1 for $BD^2 = 16.4^2 - 6.5^2$ and/or SC1 for their $BD - 10$ e.g. accept $\tan^{-1} \frac{\text{their } DB}{6.5}$ M1 for $\cos \hat{D}CB = \frac{6.5}{16.4}$ oe
2	(a) $(2x - 1)(2x + 1)$ (b) (i) 3 (ii) $(R =) \frac{2Q}{P-1}$ asc (c) $x = 7 \quad y = -1$ (d) (i) $3.2x + 16$ (ii) $x > 73.125$ isw (iii) 74	1 1 3 3 2 2 1ft	SC2 for $\frac{2Q}{P+1}$ or $-\frac{2Q}{P+1}$ M2 for $\frac{2Q}{R} = P - 1$ or $PR - R = 2Q$ or M1 for $P = \frac{2Q}{R} + 1$ or $PR = 2Q + R$ soi B2 for one correct M1 for eliminating one variable B1 for $(x + 20) \times 0.8$ oe seen B1 for their answer to (i) > 250
3	(a) (i) 43.2 (0) seen isw (ii) 25 isw (iii) 3.5	1 2 2	SC1 for answer 125 % M1 for Figs $\frac{45-36}{36}$ M1 for Figs $\frac{3000 \times 0.45 - 1302.75}{3000 \times 0.45}$

Page 3	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2012	4024	22

	(b) 0.6 (0)	3	M2 for $5.40 - \frac{5.40 \times 100}{112.5}$ oe or M1 for $x + \frac{12.5}{100} x = 5.40$ oe and A1 for $5.40 - \text{their } x \text{ ft}$ or B1 for division by 112.5 seen and dependent B1 for multiplication by 12.5 seen.
4	(a) (i) 102 (ii) (i) ft (102) (iii) 180 – (ii) ft (78) (b) (i) Similar triangles established www (ii) 7.2	1 1ft 1ft 2 2	B1 for a correct pair of equal angles B1 for corresponding sides in the ratio 5 : 2 soi
5	(a) 220 (b) 2130 (c) 8.33	3 3 2	M1 for $\frac{150}{360} \times 2 \pi r$ and B1 for their arc AD + their arc BC + 50 M2 for $\frac{150}{360} \pi (45^2 - 20^2)$ or M1 for $\frac{150}{360} \pi r^2$ M1 for $2\pi r = \text{their arc } AD$ from (a) soi
6	(a) 158 www (b) (i) $\frac{60}{150}$ oe isw (ii) $\frac{4800}{22350}$ oe isw	3 1 2	B1 for $10 \times 135 + 30 \times 145 + 20 \times 152.5 + 30 \times 157.5 + 35 \times 165 + 25 \times 180$ and B1 for division by $10 + 30 + 20 + 30 + 35 + 25$ B1 for $\frac{60}{150} \times \frac{40}{149}$ seen or $2 \times \frac{60}{150} \times \frac{40}{150} (= \frac{4800}{22500} = 0.213)$

Page 4	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2012	4024	22

	(c) Correct Histogram	3	H2 for 3 correct additional columns H1 for 1 correct additional column After 0 SC2 for all additional heights correct SC1 for 3 additional heights correct
7	(a) (i) 874 (ii) 3070 (b) (i) 77 (.0) (ii) 500 (iii) 2410	3 2ft 1 3ft 3	M2 for $(2) \pi r^2 + 2\pi r \times 8$ or M1 for either $(2) \pi r^2$ or $2\pi rh$ M1 for Figs $[(their\ 874 + 150) \times 3]$ or B1 for $\div 10^4$ M2 for $\pi R^2 - 4\pi r^2 + 4(b)(i)$ or M1 for $\pi R^2 - 4\pi r^2$ or $4(b)(i)$ M2 for $\pi R^2 \times 8 - 4 \times \frac{2}{3} \times \pi \times r^3$ or M1 for $\pi R^2 \times 8$ or $4 \times \frac{2}{3} \times \pi \times r^3$
8	(a) - 2.1 (b) Correct plots and curve (c) - a ft 1 cao b ft (d) -3.5 to -2 (e) (1.7) ft (f) $1 < k < 2$. ft	1 3 2 2 2ft 2ft	P2 for 7 or 8 correct plots ft or P1 for at least 4 correct plots and dependent C1 for a smooth curve through all plotted points B1 for at least one solution ft M1 for the correct tangent drawn M1 for $y = x$ drawn. B1 for one correct end point ft or clearly using TP's.

Page 5	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2012	4024	22

9	(a) 42.3	3	M2 for $\frac{30 \sin 58}{\sin 37}$ or M1 for $\frac{AB}{\sin 58} = \frac{30}{\sin 37}$ oe
	(b) 83.9	4	M3 for $\sqrt{30^2 + 64^2 - 2 \times 30 \times 64 \cos(180 - 58)}$ M2 for $30^2 + 64^2 - 2 \times 30 \times 64 \cos(180 - 58)$ or M1 for $30^2 + 64^2 + 2 \times 30 \times 64 \cos(180 - 58)$ and A1 for 54.4
	(c) 814	2	M1 for $\frac{1}{2} \times 30 \times 64 \sin((180 -)58)$ oe
	(d) 17.2	3	M2 for $30 \sin 58 \tan 34$ or M1 for $\frac{H}{\text{their } AP} = \tan 34$ or $\tan 56$ or B1 for $AP = 30 \sin 58 (= 25.4)$ oe soi
10	(a) Congruency established	3	B2 for $\widehat{SAP} = \widehat{PBQ}$ and $AP = BQ$ or $AS = PB$ or B1 for the equal angle or either pair of sides
	(b) (i) $40 - x$	1	
	(ii) $(y =) 2x^2 - 80x + 1600$ correctly obtained	2	M1 for $\frac{1}{2} \times x \times \text{(b)(i)}$ or $\sqrt{(40 - x)^2} + x^2$ seen
	(c) (i) $x^2 - 40x + 250 = 0$	1	
	(ii) 7.8 32.2	3	B2 for 7.8 and 32.2 or better or B1 for $\sqrt{(-40)^2 - 4 \times 1 \times 250}$ soi and B1 for $\frac{-(-40) \pm \sqrt{\text{their } 600}}{2 \times 1}$ soi and After B0 B1 , allow SC1 for a correct ft for both roots or B1 for one correct solution or both 8 and 32.
	(d) Accurately drawn quadrilaterals	2ft	B1 for one correct ft or both mirror images

Page 6	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2012	4024	22

11	(a) (i) (a) $-p + q$	1	
	(b) $\frac{1}{3}(4q - p)$ oe isw	1ft	
	(c) $2q - \frac{1}{2}p$ oe isw	1	
	(ii) E, C and D lie on a straight line CD is $\frac{2}{3}$ of ED oe	2	B1 for either
	(b) (i) Correct triangle	2	B1 for two correct vertices or triangle correct size and orientation
	(ii) Correct triangle	2	B1 for two correct vertices or triangle correct size and orientation
	(iii) Rotation clockwise 90 centre (0,3)	3	B1 for rotation soi and B1 for clockwise 90 or centre (0,3)

MARK SCHEME for the October/November 2013 series

4024 MATHEMATICS (SYLLABUS D)

4024/21

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

Page 2	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2013	4024	21

Qu	Answers	Mark	Part Marks
1	(a) (i) 468	1	
	(ii) 700	1	
	(iii) 550	2	B1 for factor $\frac{1.10}{1.56}$ soi
	(b) 19 926	3	M2 for $\frac{x}{81} - \frac{x}{82} = \pm 3$ or B1 for $\frac{x}{81}$ or $\frac{x}{82}$ seen
2	(a) Correct triangle	2	B1 for 40° or 8 cm.
	(b) Complete locus	2	B1 for at least one parallel line or at least one circular arc.
	(c) <i>P</i> correctly placed ft	2ft	B1 for perpendicular bisector of <i>BC</i> or Arc centre <i>A</i> radius 6.5
3	(a) (2,3)	1	
	(b) $\frac{4}{8}$ oe	1	
	(c) 2 ft	2ft	M1 for $y = (b)x + c$
	(d) $\begin{pmatrix} 8 \\ 4 \end{pmatrix}$	1	
	(e) (–3,–2) and (13,6) ft	3ft	B2 for one correct point or M2 for $\begin{pmatrix} 8 \\ 4 \end{pmatrix} = (\pm) \begin{pmatrix} h-5 \\ k-2 \end{pmatrix}$ or M1 for $\overrightarrow{AB} = (\pm)\overrightarrow{CD}$
4	(a) $3.5 < x \leq 4$	1	
	(b) Correct frequency polygon	2	B1 for 5 correct plots or all heights consistently mis-plotted.
	(c) (i) Completed table	1	
	(ii) Correct cumulative frequency curve.	2 ft	P1 for 5 points plotted ft (and joined) or All points consistently mis-plotted.
	(d) (i) ft at $y = 50$ (3.4)	1ft	
	(ii) ft at $y = 10$ (2.3)	1ft	

Page 3	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2013	4024	21

5	(a) 1 (b) (i) $5(x + y)$ (ii) $(3x + 4)(3x - 4)$ (c) (i) $(2x - 3)(x + 4)$ (ii) $\frac{3}{2} - 4$ (d) 4	1 1 1 1 1ft 2	B1 for $k = 36$ or M1 for $L = \frac{k}{d^2}$ soi
6	(a) (i) 19.93 from correct rounding (ii) 28.3 (b) (i) 25 (ii) 37.2 or 37.3	2 3 1 3	M1 for $\frac{CD}{31} = \cos 50$ oe M1 for $\frac{31}{AC} = \cos 50$ oe and M1 for $AC - 19.93$ SC If 2nd M not earned, A1 for 48.2 M1 for $\frac{PR}{52} = \tan 65$ oe or $\frac{QR}{52} = \tan 55$ oe and M1 for $PR - QR$ SC If 2nd M not scored, A1 for 111.5 or 74.26
7	(a) (i) The three facts for Congruency stated (ii) $(x =) z - y$ oe isw (b) 228	3 2 2	B1 for angle $EAD =$ angle DAC and B1 for either $AE = AC$ or AD common B1 for angle $AED = z$ or $z = x + y$ B1 for 132 seen or (angle $SQR =$) 21 and (angle $SRQ =$) 27 soi
8	(a) 7.14 (b) (i) Equiangular triangles established (ii) $x^2 - 18x + 55 (=0)$ correctly found	3 3 2	M2 for reaching $7^2 + r^2 = 10^2$ soi or M1 for correct right angled triangle soi B2 for two pairs with no reason. Or for one pair of equal angles with reason. Or B1 for any pair of equal angles. M1 for $\frac{x}{5} = \frac{11}{18 - x}$ oe

Page 4	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2013	4024	21

	(iii) 3.9 14.1 (iv) 10.2 ft	3 1ft	B1 for $\sqrt{(-18)^2 - 4 \times 1 \times 55}$ soi and B1 for $\frac{-(-18) + (or -)\sqrt{their 104}}{2 \times 1}$ soi If B1 or B0 at this stage, allow M1 for both values of $\frac{p \pm \sqrt{q}}{r}$
9	(a) 4050 (b) Correct plots ft and curve (c) (1700) ft (d) (i) (870) ft (ii) Rate of increase (of number of bacteria per hour) (e) ($k =$) 50 ($a =$) 3 (f) (i) Correct straight line (ii) 3.45 ft	1 3 1 2 1 1 2 1	P2 for 5 correct plots ft or P1 for 4 correct plots ft M1 for a tangent at $t = 2.5$ L1 for correct intercept or Correct gradient
10	(a) (i) 11.9 (ii) 1.73 or 1.74 (iii) 9.1% ft (b) (i) 19 100 (ii) 22 ft	2 4 2ft 1 3ft	B1 for $k \times 2\pi r \times h$ M1 for $\frac{1}{2} \times 0.8 \times 0.8 (\times \sin 90)$ oe and M1 for $(\frac{90}{360})\pi \times 0.8^2$ and M1 for $(their 0.5026 - their 0.32) \times 9.5$ M1 for $\frac{(a)(ii)}{19.1} \times 100$ M1 for figs $\frac{25(000)}{their (b)(i) \times 6(0)} = N$ and B1 for $N \times 10^3$
11	(a) (i) Shear, scale factor $\frac{3}{2}$ (ii) $\begin{pmatrix} 1 & 1.5 \\ 0 & 1 \end{pmatrix}$	2 2	B1 for Shear only or SF 1.5 B1 for one element incorrect or M1 for $\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 1 & 3 & 3 \\ 2 & 2 & 6 \end{pmatrix} = \begin{pmatrix} 4 & 6 & 12 \\ 2 & 2 & 6 \end{pmatrix}$

Page 5	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2013	4024	21

	(b) (i) Triangle C (ii) Stretch(ing) (iii) $\frac{1}{2}\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$ oe isw (iv) $2 : 1$ oe (c) $\begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix}$	2 1 2 1 2	B1 for two vertices correct or M1 for $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 4 & 6 & 12 \\ 2 & 2 & 6 \end{pmatrix}$ B1 for $\det = 2$ soi or $\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$ soi or M1 for $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} p & q \\ r & s \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ B1 for one element incorrect or M1 for $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 1.5 \\ 0 & 1 \end{pmatrix}$
12	(a) (i) $\frac{5 \sin 65}{\sin 65 - \sin 45}$ correctly obtained. (ii) 22.7 or 22.8 (b) (i) $-\frac{11}{40}$ isw (ii) $\frac{11}{40}$ ft (c) Correct triangle DEG (d) 6	3 1 3 1ft 1 3	M1 for $\frac{BC}{\sin 65} = \frac{AC}{\sin 45}$ oe soi and B1 for $AC = BC - 5$ oe M2 for $13^2 = 6^2 + 10^2 - 2 \times 6 \times 10 \times \cos PRQ$ or M1 for $13^2 = 6^2 + 10^2 + 2 \times 6 \times 10 \times \cos PRQ$ A1 for $\frac{33}{120}$ or M1 for $13^2 = 6^2 + 10^2 - \times 6 \times 10 \times \cos PRQ$ A1 for $-\frac{33}{60}$ B1 for Triangle LMN with angle $M = 30$ soi and M1 for $\frac{1}{2} \times LM \times MN \times \sin 30$ soi

MARK SCHEME for the October/November 2013 series

4024 MATHEMATICS (SYLLABUS D)

4024/22

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

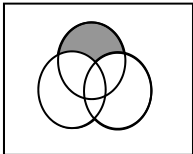
Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

Page 2	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2013	4024	22

Qu	Answers	Mark	Part Marks
1	(a) 3760 (b) 42(.0) (c) 54.1	3 2 2	B1 for a correct Δ such as $\frac{1}{2} \times 34 \times 40$ B1 for $\frac{1}{2} (40 + 58) \times 38$ oe soi M1 for $(BC^2 =) 38^2 + (58 - 40)^2$ M1 for $\tan CDE = \frac{58}{42}$ oe
2	(a) (i) 1.24 isw (ii) $x = 3 \quad y = 5$ (b) (i) $\frac{1}{12}$ (ii) Correct pie chart labelled.	2 2 1 3	M1 for $(0 \times 4) + 35 \times 1 + 2 \times 6 + 3 \times 5$ B1 for either $x = 3$ or $y = 5$ or M1 for $37 \times 1 + 2y + 3 \times 5 = 62$ oe soi or for $x + 37 + y + 5 = 50$ soi B2 if no or incorrect labels or One correct angle with an additional label. B1 for one angle in tolerance or Two angles calculated.
3	(a) $-\frac{1}{8}$ (b) $6x^3 - 3$ or $3(2x^3 - 1)$ (c) (i) $(9x - 4)(x + 1)$ (ii) $\frac{4}{9} - 1$ (d) 27, 28, 29	2 2 1 1 2	B1 for 1 or -8 or M1 for $\frac{-4 + \sqrt{(-4)^2 + (-3)^2}}{(-4)^2 - 2(-4)(-3)}$ M1 for $6x^3 - 2x + 9x^2 - 3 - 9x^2 + 2x$ B1 for such as $n, n + 1, n + 2$ seen
4	(a) 72 justified (b) (i) Congruency established (ii) (a) Kite (b) 90	2 3 1 1	B1 for 72 or either D or $E = 90$ B1 + B1 for two pairs of equal sides SC1 After 0, accept all sides the same oe.

Page 3	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2013	4024	22

5	(a) (i) 3 (ii) {4, 8, 10} (b) 66 (c) (i)  (ii) $C' \cap (A \cup B)$ oe	1 1 2 1 1	M1 for $y + 13 + 11 = 90$ oe or B1 for 52 soi
6	(a) (i) 899 (ii) 33.5 (iii) 900 (b) 4.5	1 2 2 3	B1 for figs $\frac{2400 - 1596}{2400}$ oe M1 for $x + \frac{20}{100}x = 1080$ or B1 for 120 seen M2 for $600 + \frac{3R}{100} \times 600 = 681$ or M1 for $600 \times \frac{R}{100} = (681 - 600)$ and A1 for 13.5 or B1 for $\frac{600 \times (3)R}{100}$ soi
7	(a) $\begin{pmatrix} 6 \\ 7 \\ 15 \end{pmatrix}$ (b) $\begin{pmatrix} 13 \\ 10 \end{pmatrix}$ (c) (i) $\frac{1}{4} \begin{pmatrix} 4 & 0 \\ 2 & 1 \end{pmatrix}$ oe isw (ii) $\begin{pmatrix} -2 & 0 \\ -2 & 1 \end{pmatrix}$	2 2 2 2	B1 for 2 correct entries or for $\begin{pmatrix} 10 \\ -5 \\ 15 \end{pmatrix}$ or $\begin{pmatrix} 4 \\ -12 \\ 0 \end{pmatrix}$ soi B1 for one entry correct or for both 13 and 10 seen but not in this form. B1 for $\det \begin{pmatrix} 1 & 0 \\ -2 & 4 \end{pmatrix} = 4$ soi or $\begin{pmatrix} 4 & 0 \\ 2 & 1 \end{pmatrix}$ B1 for three entries correct or $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ soi

Page 4	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2013	4024	22

8	(a) 44.5	3	M1 for numerical $\frac{\theta}{360} \times 2\pi \times 6$ oe and M1 for <i>their</i> arc + 12 If second M not scored, A1 for 32.46 or 5.24 soi. SC1 after 0 for $2\pi 6$ seen (= 37.7)
	(b) 97.4	2	M1 for numerical $\frac{\theta}{360} \times \pi \times 6^2$ SC1 after 0 for $\pi 6^2$ (= 113) seen
	(c) (i) 11.4	3	M1 for $\frac{x}{6} = \cos 25$ (= 5.44) oe and M1 for <i>their</i> 5.44 + 6. If the second M not scored, A1 for 5.44 SC1 after 0 for identifying a right-angled triangle that would lead to $x = 5.44$.
	(ii) 19.0	4	M1 for $\frac{1}{2} \times 6 \times 6 \times \sin 50$ oe and A1 for 13.79 (correct triangle only) M1 for $12 \times$ (c) (i) soi and M1 for $\frac{12 \times \text{(c)(i)} - A}{12 \times \text{(c)(i)}} \times 100$
9	(a) Correct plots and curve	2	P1 for at least 5 correct plots
	(b) (− 0.8)	2ft	M1 for the tangent drawn at $x = 0.75$
	(c) (i) − b	1	
	(ii) Completed table	1	
	(iii) Correct curve	1	
	(iv) − (0.8 ± 0.2) cao	1	
	(d) (i) Correct straight line	1	
	(ii) (0.3) (1.7)	1ft	
	(iii) $2x^2 - 4x + 1 (= 0)$ or equivalent three term expression.	2ft	M1 for $x + \frac{1}{4} = 4 - x$ oe

Page 5	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2013	4024	22

10	(a) (i) 11.9	4	M3 for $\sqrt{8^2 + 6^2 - 2 \times 8 \times 6 \times \cos 115}$ M2 for $8^2 + 6^2 - 2 \times 8 \times 6 \times \cos 115$ M1 for $8^2 + 6^2 + 2 \times 8 \times 6 \times \cos 115$ and A1 for 7.71 or M1 for $8^2 + 6^2 - 8 \times 6 \times \cos 115$ and A1 for 10.96 or M1 for $8^2 + 6^2 - 2 \times 8 \times 6 \times \sin 115$ and A1 for 3.60 or M1 for $8^2 - 6^2 - 2 \times 8 \times 6 \times \cos 115$ and A1 for 8.28
	(ii) 265° cao	2	B1 for 85, 95 seen or M1 for $200 - 115$.
	(b) (i) $\frac{200 \sin 65}{\sin 35}$ correctly obtained	2	M1 for $\frac{PR}{\sin 65} = \frac{200}{\sin RPQ}$ oe B1 for $180 - (44 + 36 + 65)$
	(ii) $\frac{200 \sin 65 \sin 36}{\sin 35 \sin 44}$ correctly obtained	2	M1 for $\frac{SR}{\sin 36} = \frac{PR}{\sin 44}$ oe
	(iii) 267	1	
	(iv) 2.34 ft or $\frac{200 + (b)(iii)}{200}$	1ft	

Page 6	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2013	4024	22

11	(a) $\frac{10p-29}{(p+2)(2p-3)}$ Final Answer	3	M1 $\frac{7(2p-3)-4(p+2)}{(p+2)(2p-3)}$ B1 for $14p-21-4p-8$ seen
	(b) (i) $\frac{320}{x}$ isw	1	
	(ii) $2x^2 + 5x - 20 (= 0)$ correctly found	3	M2 for <i>their</i> $\frac{320}{x} - \text{their} \frac{320}{x+2\frac{1}{2}} = 80$ oe M2 for <i>their</i> $\frac{320}{x} - \text{their} \frac{320}{x+2\frac{1}{2}} = -80$ oe SC1 after 0 for $\frac{320}{x+2\frac{1}{2}}$ seen.
	(iii) 2.15 – 4.65	3	B1 for $\sqrt{5^2 - 4 \times 2 \times (-20)}$ soi and B1 for $\frac{-5 \pm \sqrt{\text{their } 185}}{2 \times 2}$ soi If B1 or B0 at this stage, allow M1 for both values of $\frac{p \pm \sqrt{q}}{r}$
	(iv) 69	2	M1 for $\frac{320}{\text{their} + \text{ve } x + 2.5}$ oe

Page 7	Mark Scheme	Syllabus	Paper
	GCE O LEVEL – October/November 2013	4024	22

12	(a) (i) 6.08	1	
	(ii) $\begin{pmatrix} 2 \\ -1.5 \end{pmatrix}$	2	B1 for $\begin{pmatrix} -1 \\ -2 \end{pmatrix}$ or $\frac{1}{2}\begin{pmatrix} 6 \\ 1 \end{pmatrix}$ oe or M1 for $(\overrightarrow{EH} =) \overrightarrow{EA} + \overrightarrow{AH}$
	(iii) $\begin{pmatrix} 2 \\ -1.5 \end{pmatrix}$	1	
	(iv) Equal and parallel	1	Dependent on (ii) and (iii) correct.
	(v) Shows G is midpoint of CD	2	M1 for $\begin{pmatrix} -3 \\ 0 \end{pmatrix} + \begin{pmatrix} -2 \\ -4 \end{pmatrix} + \begin{pmatrix} 6 \\ 1 \end{pmatrix}$ oe seen or B1 for $(\overrightarrow{CD} =) 2\overrightarrow{CG} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$
	(b) (i) Correct triangle (B)	2	B1 for two vertices correct or positive enlargement centre (1, 2) or an enlargement scale factor 1.5.
	(ii) Correct triangle (C)	2	B1 for two vertices correct or negative enlargement centre (1, 2) or An enlargement scale factor – 0.5.
	(iii) 1 : 9 oe	1	

MARK SCHEME for the October/November 2014 series

4024 MATHEMATICS (SYLLABUS D)

4024/21

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2014 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	4024	21

Abbreviations

cao	correct answer only
cso	correct solution only
dep	dependent
ft	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
www	without wrong working
soi	seen or implied

Question	Answers	Mark	Part Marks
1 (a) (i)	6	1	
(ii)	$\frac{1}{500}$	1	
(iii)	2.7	1	
(b)	9	1	
(c) (i)	3.5	2	B1 for 1.2 seen or division by 120 or M1 for $x + \frac{20x}{100} = 4.2$ oe
(ii)	Special promotion tin + working	2	M1 attempt at one rate
2 (a)	15 05 or 3 05 pm	2	B1 for (0)9 05 or (0)3 50 seen
			or M1 for 21 50 + 11 15 or 21 50 + 6
(b)	11 hours 55 minutes	2	B1 for (0)1 45 or 5 hours and 55 minutes seen or M1 for 13 40 – (0)7 45 + 6 oe
(c) (i)	290 (280 to 300)	1	
(ii)	45 or ft from their (c)(i)	1	
(d)	827	2	M1 for $683 + k \times 24$
3 (a) (i)	Correct quadratic graph through 11 points	3	B2 for curve through at least 8 ft points or for 11 ft points or B1 for 16 in the table twice or for 6 ft points
(ii)	– 2.35 to – 2.25 and 4.25 to 4.4	2ft	B1 for one correct solution or M1 for $y = 2$ drawn
(iii)	3.25 to 4.75	2	B1 for tangent drawn at $x = 3$ or for a gradient in range

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	4024	21

(b)	2.54, – 3.54	3	Working seen and www B1 for $\sqrt{1^2 - 4 \times 1 \times (-9)}$ soi and B1 for $\frac{-1 \pm \sqrt{their 37}}{2 \times 1}$ After B1 or B0 so far, M1 for both real values of $their \frac{p \pm \sqrt{q}}{r}$
(c)	$(y =) - 3x + 1$	2	B1 for $(y =) - 3x + c$ or $(y =) mx + 1$ or M1 for (i) theoretical or (ii) practical
4 (a)	$p = 12, q = 16$	2	B1 for one correct Or M1 for $k \times 5$ or $l \times 2.5$ where k and l are attempts to read from the histogram
(b) (i)	29.5	3	M1 for sum of the midvalues $\times$ frequency and M1 for division by 60
(ii)	2070	2	M1 for attempt to use upper bounds of individual intervals
5 (a)	19.46 seen	4	Working seen. No wrong working. M2 for $14^2 + 8^2 - 2 \times 14 \times 8 \times \cos 122$ and A1 for 378.7 soi or M1 for an incorrect formula with one error and A1 for 141.3 or 319.35 or 250.7 soi
(b)	37.5 to 37.6	3	M2 for $\frac{14 \sin 122}{19.5}$ or M1 for $\frac{\sin B}{14} = \frac{\sin 122}{19.5}$ oe SC1 for correct method for wrong angle
(c)	247 to 248	4	M1 for $0.5 \times 8 \times 8 \times \sin C = 26$ oe soi and A1 for 54.34 and M1 for $180 - their 54.34$ or $238 - their 54.34$ SC1 after 0 for CE = 8
6 (a)	-1	1	
(b)	$\frac{x+7}{2}$	2	M1 for $x = 2y - 7$ soi or SC1 for the answer $\frac{y+7}{2}$
(c)	$g = 2.2$ or $2\frac{1}{5}$ or $\frac{11}{5}$	3	B1 for $2(3g) - 7 = g + 4$ soi and B1 for $mg = 11$ or $5g = n$ or SC1 after B0 for solving $their$ linear $f(3g) = g + 4$

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	4024	21

7	(a) (i)	$\frac{3}{4}$ or 0.75	1	
	(ii)	$(y =) -4$	2	M1 for $4y - 6y - 3 = 5$ or correctly rearranges their linear equation
	(b)	$\frac{3w}{w+2}$ final answer	3	B1 for $15w(w-2)$ and B1 for $5(w+2)(w-2)$
	(c) (i)	$p(p+20)$ or $p^2 + 20p$	1	
	(ii)	Correct equation and the given form correctly derived.	2	M1 for $35(p^2 + 20p)$ and A1 for $35(p^2 + 20p) = 122500$ And the given form established.
	(iii) (a)	$p = 50$ and $p = -70$	2	M1 for $(p \pm h)(p \pm k)$ where $hk = 3500$
	(b)	70	1ft	Accept <i>their</i> positive $p + 20$
8	(a) (i)	112 to 116	1	
	(ii)	Perpendicular bisector of AB	1	
	(iii) (a)	Correct region shaded.	2	M1 for clearly identifiable arc centre B radius 8cm
	(b)	2.9 to 3.1	1	
	(iv)	Yes as path of D passes through the shaded region	2	M1 for line from their D on a bearing 075
	(b) (i)	9.43	2	M1 for $(PR^2 =) 5^2 + 8^2$
	(ii)	6.38 to 6.39	3	M2 for $\sin 53 = \frac{x}{8}$ oe or B1 for correct triangle soi
9	(a)	-1	1	
	(b)	correct triangle	2	B1 for two vertices correct or for an incorrect reflection
	(c)	$x = -2.5$	1	
	(d)	4	1	
	(e)	Correct octagon	2	M1 for 6 correct vertices or octagon scale factor 2 incorrectly placed

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	4024	21

(f) (i)	1575	2	B1 for any correct relevant area such as 2025 or 1125 or 112.5 soi or M1 for a complete, consistent, method
(ii)	30	1	
(iii)	10350	2ft	ft <i>their</i> 900 + 6 × <i>their</i> 1575 B1 for 450 seen or M1 for complete, consistent, method
10 (a) (i) (a)	2x	1	
(b)	4x	1	
(c)	90 – 2x oe	1ft	
(ii)	19	3	M2 for $180 - 3x = 123$ oe or B1 for $\hat{B}E0 = (180 - 123)$
(b) (i)	22.3	2	M1 for $\frac{40}{360} \times \pi \times 8^2$
(ii)	476 to 477	4	M1 for $\frac{40}{360} \times \pi \times 16$ and M1 for 2 × <i>their</i> 22.3 and B1 for 8 × 20
11 (a) (i)	23 to 25	1	
(ii)	12 45 (pm)	1	
(iii)	1.9	1	
(iv) (a)	Straight lines to (14 45, 5.4) and from (14 45, 5.4) to (15 39, 0)	2	M1 for straight line $d = 5.4$ or straight line from <i>their</i> (14 45, 5.4) to (15 39, 0)
(b)	6 cao	1	
(b) (i)	Correct sectors and labels	2	M1 for sector of 30 or 150
(ii)	$\frac{5}{12}$ or 0.417 or 0.4166....	1	
(iii)	$\frac{41}{66}$ oe, 0.621	3	M2 for $1 - \frac{5}{12} \times \frac{4}{11} - \frac{6}{12} \times \frac{5}{11}$ oe or M1 for such as $\frac{5}{12} \times \frac{4}{11}$ or $\frac{6}{12} \times \frac{5}{11}$ After 0, SC1 for $(2) \times \frac{5}{12} \times \frac{6}{12} + (2) \times \frac{5}{12} \times \frac{1}{12} + (2) \times \frac{6}{12} \times \frac{1}{12}$

MARK SCHEME for the October/November 2014 series

4024 MATHEMATICS (SYLLABUS D)

4024/22

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2014 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.



Page 2	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	4024	22

Question	Answers	Mark	Part Marks
1 (a) (i)	30%	2	M1 for figs($5625 \div 18\,750$) or SC1 for 70(%) as final answer
(ii)	305	3	M1 for $(13125) \times \frac{22}{100}$ oe and M1 for $\frac{18750 - \text{their } 2887.5}{52}$
(iii)	15 000	2	M1 for $x + \frac{25x}{100} = 18750$ oe or B1 for $\div 125$
(b) (i)	65400	1	
(ii)	294	1	
(iii)	877	2	B1 for use of the quotient of the rates
2 (a) (i)	23	1	
(ii)	90 with reason	1	
(iii)	Parallel lines established	1	
(b)	Convincing argument	3	This must have e.g. $XQ = XY$ justified. If there is no justification, then MAX B2 from B1 for $XQ = XY$ oe And B1 for relating this to the perimeter of PXZ Or B1 for equal (alternate or bisected) angles
3 (a)	$\frac{1}{16}$ or 0.0625	1	
(b)	$\frac{42}{256}$ or 0.164 oe	3	B2 for $(2) \times \frac{7}{16} \times \frac{3}{16}$ or B1 for both $\frac{7}{16}$ and $\frac{3}{16}$ or SC1 after 0 for $\frac{7}{40}$
(c) (i)	26	1	
(ii)	$m = 5 \quad n = -3$	2	B1 for one correct or M1 for correct substitution and evaluation of the other variable or for an equation in one variable
(d)	$p = 17$	2	M1 for $p \times \text{their } m - 4 \times \text{their } n (= 97)$ oe

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	4024	22

4	(a) (i)	105	2	B1 for $\left(\frac{1}{2}\right) \times 7 \times 3 \times 10$ or M1 for Area of cross section $\times 10$ soi
	(ii)	197.2 (m ²)	4	M1 for $3^2 + 7^2$ and M1 for area of one triangular face and M1 for area of one rectangular face
	(b) (i)	0.845	2	M1 for $\frac{h}{2} = \sin 25$ oe
	(ii)	0.280	2	M1 for $\frac{y}{0.6} = \tan[\dots]$ oe or SC1 for 25
5	(a)	63.7 or 63.6 (m)	2	M1 for $\pi \times \frac{d}{2} = 100$
	(b)	9540 to 9560	3ft	M1 for πr^2 soi and M1 for <i>their</i> circular area + $100 \times \text{their (a)}$
	(c) (i)	18.7 to 19.0 (m)	3ft	M1 for $2\pi R$ And M1 for <i>their</i> $2\pi R - 200$ or $\pi R - 100$
	(ii)	30.8 to 31.1	2ft	M1 for $\frac{\theta}{360} \times 2\pi r$ oe
6	(a)	Correct shape ABCD	4	B1 for $\widehat{ABC} = 56$ B1 for $\widehat{BAD} = 104$ M1 line $CD \parallel AB$ A1 for perpendicular length 4.5
	(b)	115 – 125 m	2ft	M1 for <i>their</i> CD
7	(a) (i)	Convincing argument	3	www e.g. need to see $\mathbf{b} - \mathbf{a}$ and $\frac{5}{3}(\mathbf{b} - \mathbf{a})$ B1 for $\overrightarrow{DE} = \mathbf{b} - \mathbf{a}$ oe B1 for $\overrightarrow{DB} = \frac{2}{3}\mathbf{a}$ or $\overrightarrow{EC} = \frac{2}{3}\mathbf{b}$ oe soi
	(ii)	9 : 25 oe	2	B1 for at least 3 : 5 oe seen
	(b) (i)	Triangle with vertices (6, 1), (10, 1), (10, 4)	2	B1 for two vertices correct
	(ii)	Stretch(ing)	1	
	(iii)	$\begin{pmatrix} 2 & 0 \\ 2 & 1 \end{pmatrix}$	2	B1 for one error or M1 for multiplication in the correct order

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	4024	22

(iv)	$\begin{pmatrix} 1 & 0 \\ 2 & \\ -1 & 1 \end{pmatrix}$	2ft	B1 for $\frac{1}{2}$ or $\begin{pmatrix} 1 & 0 \\ -2 & 2 \end{pmatrix}$ or <i>their</i> ft values
8 (a) (i)	2.24	1	
(ii)	$(h=)\frac{T^2 g}{4\pi^2}$ oe	3	M1 for $T^2 = \frac{4\pi^2 h}{g}$ oe and M1 for any correct transposition at any stage
(b)	14	2	B1 for 42 or 16 or M1 for $45 - p - 3 = 2p$
(c)	-5.5 oe	3	M1 for $3(2x - 3) + 4(5 - x)$ oe soi and M1 for $6x - 4x = 9 - 20$ soi oe
(d)	-0.41 -3.26	3	B1 for $\sqrt{11^2 - 4 \times 3 \times 4}$ soi and B1 for $\frac{-11 \pm \sqrt{\text{their}73}}{2 \times 3}$ After B1 or B0 so far M1 for both real values of $\frac{p \pm \sqrt{q}}{r}$
9 (a) (i)	11.05 confirmed	1	
(ii)	39.1° or 39.2°	2	M1 for $\frac{1}{2} \times 5 \times 7 \times \sin PQR$
(iii)	136.3°	3	M1 for $8 \times 2 \times \sin ZWX = \frac{1}{2} \times 4 \times 6 \times \sin 67$ oe and A1 for 43.7° soi or M1 for $180 - \text{their}43.7$ soi
(b) (i)	6.16	3	M2 for $9^2 + 12^2 - 2 \times 9 \times 12 \times \cos 30$ soi or M1 for cosine formula with 1 error and A1 for 412 (soi by 20.3), 131.5 (soi by 11.5) or 117 (soi by 10.8)
(ii)	41.4	3	M2 for $\cos CAM = \frac{9^2 + 12^2 - 12.5^2}{2 \times 9 \times 12}$ oe or M1 for $12.5^2 = 9^2 + 12^2 - 2 \times 9 \times 12 \cos \theta$ oe After 0, SC1 for <i>their</i> A - 30, or one of M or C

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2014	4024	22

10 (a)	11 11	1	
(b)	correct scales, plots (ft) and curve	3	P2 correct scales and at least 7 plots (ft) or All plots correct ft or P1 for atleast 7 plots (ft) or Correct scales drawn
(c)	2 (± 0.5)	2ft	Dependent on tangent drawn at $x = 3$ M1 for tangent at $x = 3$
(d) (i)	-5 cao	1	
(ii)	(a) -1 (b) 5	2	B1 for either
(e)	(0.6) (3.4)	3ft	B1 for $x^2 - 4x - 1 = -3$ soi and B1 for the line $y = -3$ or M1 for $x^2 - 4x - 1 = k$ and A1 for the line $y = k$ SC3 for 0 for new curve drawn
11 (a)	histogram correct	3	H2 for four columns correct or H1 for one correct frequency density
(b) (i)	correct plots and give curve	2	P1 for at least 4 correct plots
(ii)	(a) (195)(g)	1ft	
	(b) 72 to 88(g)	2ft	B1 for 152 to 158 and 230 to 240 Or M1 for UQ – LQ
(iii)	50 78 72 32 4	1	
(iv)	(a) 36 cao	1	
	(b) 85 or 86 or ft (th Percentile)	2ft	B1 for 15 or 14.4 or ft Or M1 for subtraction from 240 or 250

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge Ordinary Level

MARK SCHEME for the October/November 2015 series

4024 MATHEMATICS (SYLLABUS D)

4024/21

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

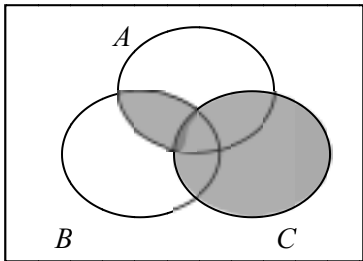
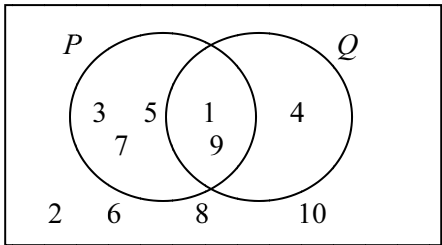
Cambridge is publishing the mark schemes for the October/November 2015 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4024	21

Question	Answers	Mark	Part marks
1 (a)	2730	2	B1 for 230 or 2557.5[0] seen or M1 for $2500 + 2500 \times 0.023 \times 4$ oe
(b)	262.5[0] final answer	2	B1 for 1012.5[0] seen or M1 for $0.15 \times 750 + 36 \times 25$ oe
(c)	$w = 4.65$ $x = [0].75$ $y = 40.5[0]$ $z = 31.35$	5	B1 for $[w =] 4.65$ B1 for $[x =] [0].75$ B2 for $[y =] 40.5[0]$ or M1 for $32.4[0] \div 0.8$ oe B1ft for 31.35
2 (a) (i)	19.2[...] or $3\sqrt{41}$	2	M1 for $[AB^2 =] 12^2 + 15^2$ or better
(ii)	128.6 to 128.7 or 129	3	M1 for $\tan \theta = \frac{\text{their } 12}{15}$ oe A1 for 38.6 to 38.7 B1ft for $[\hat{ABC} =] \text{their } \theta + 90$ Alternative method M2 for complete method using cosine rule for $\cos ABC$ using <i>their</i> 19.2
(b)	44.8[2...]	3	M2 for $\frac{7 \sin 65}{9}$ Or M1 for $\frac{9}{\sin 65} = \frac{7}{\sin x}$ oe
3 (a) (i)	$\begin{pmatrix} 3 & 4 \\ -1 & 2 \end{pmatrix}$	2	B1 for one row or one column correct
(ii)	$\frac{1}{4} \begin{pmatrix} 2 & -2 \\ 3 & -1 \end{pmatrix}$ or $\begin{pmatrix} 1 & -1 \\ 2 & 2 \\ 3 & 1 \\ 4 & -4 \end{pmatrix}$ oe isw	2	B1 for $\det = 4$ soi or for $\begin{pmatrix} 2 & -2 \\ 3 & -1 \end{pmatrix}$
(b)	$\begin{pmatrix} 4 & -2 \\ 0 & -6 \end{pmatrix}$ oe	2	B1 for one row or one column correct Or M1 for $2\mathbf{C} = -4 \begin{pmatrix} -2 & 1 \\ 0 & 3 \end{pmatrix}$ oe or for $-\frac{1}{2}\mathbf{C} = \begin{pmatrix} -2 & 1 \\ 0 & 3 \end{pmatrix}$

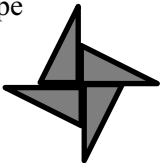
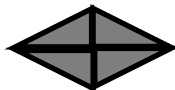
Page 3	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4024	21

Question	Answers	Mark	Part marks
(c) (i)	$\begin{pmatrix} 3110 \\ 2715 \\ 2750 \end{pmatrix}$	2	B1 for 2 elements correct in a 3 by 1 matrix or all 3 values correct in dollars or M1 for $\begin{pmatrix} 1950 + 1160 \\ 975 + 1740 \\ 1300 + 1450 \end{pmatrix}$
(ii)	Amount [in cents] for each week	1	
(iii)	85.75 cao	1	
4 (a)		1	
(b)	$E \cap (D \cup F)'$ or $(D \cup F)' \cap E$	1	Or $E \cap D' \cap F'$
(c) (i)		2	B1 for 8 or 9 numbers correctly placed or for 10 numbers correctly placed with one additional number or for 1, 3, 4, 5, 7, 9 seen correctly positioned and no numbers positioned incorrectly
(ii)	7	1ft	
(iii)	$\frac{3}{10}$ oe	2ft	B1 for <i>their</i> 3 seen as numerator of a fraction soi
5 (a)	$3x^2y(2y^2 - 5x)$	2	B1 for $3x^2(2y^3 - 5xy)$ or $3y(2x^2y^2 - 5x^3)$ or $x^2y(6y^2 - 15x)$ or $3xy(2xy^2 - 5x^2)$ or $3x^2y(A - 5x)$ or $3x^2y(2y^2 - B)$

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4024	21

Question	Answers	Mark	Part marks
(b)	$x = \pm 1.63[\dots]$ or $\pm \sqrt{\frac{8}{3}}$	3	M1 for $\frac{4(x+2)+2x}{x(x+2)} = 3$ soi M1dep for $4x + 8 + 2x = 3x^2 + 6x$ or better
(c) (i)	Correct region shaded with 4 correct lines	3	B2 for 3 or 4 correct lines or B1 for 2 correct lines
(ii)	$-\frac{1}{2}$ oe	2	B1 for (3, 3) or (1, 4) soi
6 (a) (i)	$a = 1, b = -3$	2	B1 for one correct
(ii)	5.38 to 5.39 or $\sqrt{29}$	2	M1 for $\sqrt{5^2 + 2^2}$
(b) (i)	$\mathbf{b} - \frac{1}{2}\mathbf{a}$ or $\frac{1}{2}(2\mathbf{b} - \mathbf{a})$ final answer	1	
(ii)	$2\mathbf{b} + \frac{1}{2}\mathbf{a}$ or $\frac{1}{2}(\mathbf{a} + 4\mathbf{b})$ final answer	1	
(iii)	$\lambda : 3\lambda$	2dep	B1dep for $\mathbf{b} + \frac{1}{4}\mathbf{a}$ seen or $n(\mathbf{b} + \frac{1}{4}\mathbf{a})$ seen or $k = \frac{1}{2}$ or $OF = \frac{1}{2}OE$ oe

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4024	21

Question	Answers	Mark	Part marks
	SECTION B		
7 (a)	A correct shape with one of diagonal lines as line of symmetry	1	
(b)	Correct shape 	2	B1 for three additional triangles drawn round <i>M</i> , at least two correct Or SC1 for 
(c) (i)	<i>C</i> at (3, 1) (3, 3) (4, 3)	2	B1 for either vertical or horizontal correct Or for two vertices correct and correct orientation
(ii)	$y = x$ oe	1	
(iii)	Translation $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$	2	B1 for translation or $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$ Or M1 for <i>D</i> seen at (1, 3), (3, 3), (3, 4)
(iv) (a)	(2, 0) (4, 0) (4, -1)	1	
(b)	Rotation, 90° clockwise, (0,0) oe	2	B1 for two correct from: Rotation, 90° clockwise oe, (0, 0) oe
(c)	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	1	
8 (a)	$\pi r^2 + \pi r(r + 4)$ with correct working leading to $6r(r + 2)$	2	M1 for $\pi r^2 + \pi r(r + 4)$ or $\pi r(r + r + 4)$
(b)	48, 90	1	
(c)	Correct shape curve through 7 correct points	2	B1ft for at least 5 correct points plotted
(d)	$[h =] \sqrt{8r + 16}$ or $2\sqrt{2r + 4}$ $[h =] \sqrt{(r + 4)^2 - r^2}$ or better	2	M1 for $(r + 4)^2 = r^2 + h^2$ or better
(e)	16	2	M1 for $8r + 16 = 144$ oe

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4024	21

Question	Answers	Mark	Part marks
(f) (i)	4.8 to 4.95	1	
(ii)	8 cao	2	B1 for 7.[...] or M1 for substituting <i>their</i> f(i) into $\sqrt{(r+4)^2 - r^2}$
9 (a) (i)	4 [minutes] 18 [seconds]	1	
(ii)	1 [minute] 0 [seconds]	2	B1 for attempt to read at 12.5 and 37.5
(b)	10, 12, 13, 5, 2	2	B1 for 3 correct
(c)	17 [minutes] 30 [seconds]	2	B1 for three times only seen including 6, 5:30 and time in range $5:30 < t \leq 6$
(d) (i)	23	1	
(ii)	$\frac{7}{50}$ or 0.14	2	B1ft for <i>their</i> 2 + <i>their</i> 5 seen or time = 5 [mins] seen Or SC1 for answer $\frac{2}{50}$ oe
(e)	$\frac{4}{175}$ oe	2	M1 for $\frac{a}{50} \times \frac{a-1}{49}$ where $a < 50$ Or B1 for $\frac{8}{50}$ and $\frac{7}{49}$ seen Or SC1 for answer $\frac{8}{175}$ oe or answer $\frac{16}{625}$ oe
10 (a) (i)	$\frac{1}{2}(x+15)(x-3) = 75$ Correct expansion leading to $x^2 + 12x - 195 = 0$ www	M1 A1	Or equivalent equation for area
(ii)	9.2 cao	3	B2 for 9.19[8...] or 9.2[0] seen OR B1 for $\sqrt{12^2 - 4 \times 1 \times -195}$ soi And B1 for $\frac{-12 \pm \sqrt{\text{their } 924}}{2}$ oe
(iii)	7.3	2	M1 for $2AD - 0.8 + 15 + \text{their } 9.2 = 38.0$ oe Or $2BC + 0.8 + 15 + \text{their } 9.2 = 38.0$ oe Or SC1 for answer $[BC =] 6.5$

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4024	21

Question	Answers	Mark	Part marks
(b) (i)	72°	2	B1 for $\hat{LMN} = 108^\circ$ seen
(ii)	$\frac{4}{7}$	3	M2 for $126 : \text{their } 72$ soi or B1 for 126 seen Or SC2 for answer $\frac{7}{4}$
11 (a) (i)	9.19[...]	2	M1 for $\frac{1}{2} \times 4 \times 6 \times \sin 50$
(ii)	183 to 184	1ft	ft $20 \times \text{their } 9.19$
(iii)	310 to 310.5	5ft	ft $292 + 2 \times \text{their } 9.19$ B3 for 4.60 or 4.59[8...] or M2 for $4^2 + 6^2 - 2 \times 4 \times 6 \times \cos 50$ or M1 for cosine formula with one error AND M1 for $20 \times (4 + 6 + \text{their } 4.60) + 2 \times \text{their } 9.19$ oe
(b)	21.3[2...]	4	B1 for correct change of units soi M1 for use of $\pi \times r^2 \times 0.7 = 0.1$ M1 for $r^2 = \frac{0.1}{0.7 \times \pi}$ soi

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge Ordinary Level

MARK SCHEME for the October/November 2015 series

4024 MATHEMATICS (SYLLABUS D)

4024/22

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2015 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4024	22

Question	Answers	Mark	Part Marks
1 (a) (i) (a)	396	2	M1 for $\frac{60}{100} \times 360 + 15 \times 12$ or B1 for $\frac{60}{100} \times 360$ seen
(b)	110 isw	1ft	
(ii)	770	2	M1 for $x - \frac{26}{100}x = 569.80$ oe or B1 for $\div$ by figs 74
(b)	1.21	3	M2 for $\frac{850}{1.87}x = 550$ oe or B1 for $\frac{850}{1.87}$ or $\frac{1.87}{850}$ or $\frac{850}{550}$ or $\frac{550}{850}$ or $\frac{x}{1.87}$ or $\frac{550}{x}$
2 (a)	14	2	M1 for $\frac{1}{2} \times CA \times (11 - 7)$ oe or SC 1 for 28
(b)	10.8	2	M1 for $\sqrt{(8 - (-2))^2 + (7 - 11)^2}$
(c)	22.8	2ft	B1 for $[BC =] 5$ soi or M1 for $(b) + \text{their } BC + CA$
(d)	21.8	2ft	M1 for $\tan A = \frac{(11 - 7)}{(8 - (-2))}$ oe
3 (a) (i)	Convincing explanation	1	
(ii)	28	2	B1 for $\widehat{OCD} = 124$ or triangle COD isosceles soi
(iii)	76	1ft	
(b) (i)	Convincing explanation	2	B1 for a correct pair of equal angles stated
(ii)	2.5	3	B1 for $8.5 - SR$ or $8.5 - QS$ seen and M1 for $\frac{12}{5} = \frac{8.5 - SR}{SR}$ or $\frac{12}{5} = \frac{QS}{8.5 - QS}$

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4024	22

Question	Answers	Mark	Part Marks
4 (a) (i)	2.12	2	M1 for $\frac{1}{2} \times \frac{4}{3} \times \pi \times r^3 = 20$ soi or SC1 for 1.68
(ii)	6.79	2	B1 for $\sqrt[3]{\frac{50}{20}}$ or $\sqrt[3]{\frac{20}{50}}$ oe or M1 for $\left(\frac{5}{x}\right)^3 = \frac{20}{50}$ oe
(b)	187	3	M1 for $\pi(\text{figs } 15)^2$ oe and M1 for $\left[\frac{1}{2} \times \right] 4 \times \pi \times (\text{figs } 55)^2 - 50 \times$ their πr^2
5 (a)	51.2	2	M1 for $AC^2 + 40^2 = 65^2$ oe
(b)	12.7	2	M1 for $\frac{AF}{30} = \sin 25$ oe
(c)	40.4	3	M1 for $\frac{35}{AG} = \cos 30$ oe and a further M1 for $(AG =) \frac{35}{\cos 30}$ oe
6 (a) (i)	−4.62 −2.38 final answer	2	B1 for one value SC1 for both −4.6 and −2.4
(ii)	$(B =) 7 \ (C =) 11$	3	M1 for $(x + \frac{7}{2})^2 = \frac{5}{4}$ and B1 for one correct value
(b)	$x < -2$	2	M1 for isolating $3x$ and -6 soi
(c)	$(x + 3y)(6 - t)$ oe	2	M1 for the correct extraction of a common factor at any stage
(d)	$(a =) 17 \ (b =) -16$	4	M1 for equalising one set of coefficients or substitution and a further M1 for eliminating one variable or simplifying an equation in one variable and A1 for 17 and A1 for −16 After A0 , SC1 for correct substitution into one of the original equations to find the other variable

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4024	22

Question	Answers	Mark	Part Marks
7 (a)	Fully shown	2	M1 for the area sine formula
(b)	$2x^2 - 19x + 6 (= 0)$ correctly obtained	3	B1 for both $x + 12$ and $4 + 2x - 5$ and M1 for $\frac{x(2x-5)}{their(x+12)their(4+2x-5)} = \frac{1}{3}$
(c) (i)	9.17 0.33	3	B1 for $\sqrt{(-19)^2 - 4 \times 2 \times 6}$ soi and B1 for $\frac{-(-19) \pm \sqrt{their 313}}{2 \times 2}$ soi and M1 for both real values of $\frac{p \pm \sqrt{q}}{r}$
(ii)	0.33 with reason	1	
(d)	6.35	3ft	M2 for $(BC^2 =)$ $c(i)^2 + (2c(i)-5)^2 - 2 \times c(i) \times (2c(i)-5) \times \cos 25$ or M1 for correct formula with one error and A1 ft for correct evaluation from their M1 SC1 for $x^2 + (2x-5)^2 - 2x(2x-5)\cos 25$ oe
8 (a) (i)	2.62	2	M1 for $\frac{25}{360} \times 2\pi \times 6$
(ii)	7.85	2	M1 for $\frac{25}{360} \times \pi \times 6^2$
(b) (i)	39.3	1ft	
(ii)	88.8	3ft	B1 for 30 or 60 or M1 for $5 \times (a)(i)$ and indep M1 for $2 \times (a)(ii)$
(iii)	471 to 472	2ft	B1 for height = 15 and radius = 12 soi
(c) (i)	$(h =) \frac{800}{\pi r^2}$	1	
(ii)	h is divided by 4 oe	1	

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4024	22

Question	Answers	Mark	Part Marks
9 (a)	36	1	
(b)	Correct plots ft and curve	2	P1 for 6 correct plots ft
(c) (i)	$4 < \text{gradient} < 6$	2ft	B1 for tangent at $t = 4$
(ii)	Speed oe	1	
(d)	Their 2.5	2ft	B1 for their 1.8 and their 4.3
(e) (i)	Their 1.65 towards Their 4.7 away from	2ft	B1 for one correct ft
(ii)	$t^2 + \frac{48}{t} - 20 = 12$ oe isw	1	
(iii)	–32 cao	1	
10 (a)	Correct histogram	3	If 3 not scored, up to 2 marks from: B1 for correct fd's (allow one error) B1 for correct column widths B1 for correct heights from their fd's
(b)	$95 < t \leq 100$	1	
(c)	98.2	3	M1 for $\sum fx$ B1 for division by 80 seen
(d)	$\frac{28}{80}$ oe	1	
(e) (i)	$\frac{992}{6320}$ oe	2	M1 for $2 \times \frac{32}{80} \times \frac{31}{79}$ or $\frac{32}{80} \times \frac{31}{80}$
(ii)	$\frac{64}{6320}$ oe	2	M1 for $\frac{4}{80} \times \frac{8}{79}$ or $2 \times \frac{4}{80} \times \frac{8}{80}$

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2015	4024	22

Question	Answers	Mark	Part Marks
11 (a) (i)	6.08	1	
(ii)	$\begin{pmatrix} 1 \\ 4 \end{pmatrix}$	2	M1 for $\overrightarrow{AF} = \overrightarrow{AH} + \overrightarrow{HF}$ oe or B1 for $\frac{1}{2}\begin{pmatrix} 6 \\ 1 \end{pmatrix}$
(iii) (a)	$\begin{pmatrix} 4 \\ -7 \end{pmatrix}$	1	
(b)	$\overrightarrow{GD} = 2\overrightarrow{FH}$ stated or appropriate numerical vector statement	1	dep
(iv)	(9.5, 3)	1ft	
(b) (i)	Correct image	1	
(ii)	Centre (4, 0) oe Scale factor $\times 2$ oe	2	B1 for either
(iii)	(5, 2)	1	
(iv)	Correct image	2	B1 for either Stem of flag R on or parallel to $y = -x$ or Hypotenuse of flag parallel to y -axis. SC1 for correct clockwise rotation



Cambridge International Examinations
Cambridge Ordinary Level

MATHEMATICS (SYLLABUS D)

4024/21

Paper 2

October/November 2016

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2016 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

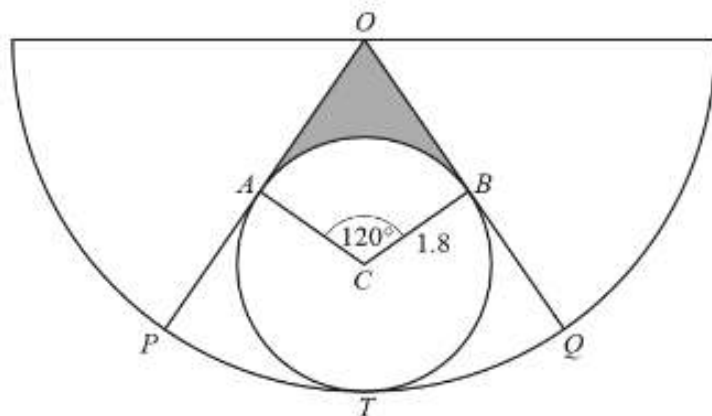
This document consists of **7** printed pages.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2016	4024	21

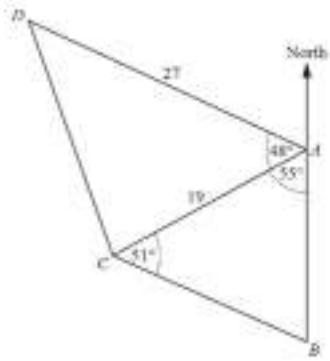
Question	Answers	Mark	Part marks
1 (a) (i)	133	1	
(ii)	20	1	
(iii)	1900	2	M1 for $\frac{1995}{105}$
(b)	22 22 or 10 22 pm	1	
(c)	6600 final answer	2	M1 for $\frac{1000000}{4 \times 38}$ oe
(d)	8.93	2	B1 for 100.5 or 11.25 used
2 (a)	2.71 or 2.711[...]	1	
(b)	$3p(3p - 2q)$ final answer	1	
(c)	$9a^2 + 6ab + b^2$ final answer	1	
(d)	$\frac{6t+1}{(2t+1)(3t+1)}$ or $\frac{6t+1}{6t^2+5t+1}$ final answer	3	M1 for $4(3t+1) - 3(2t+1)$ soi B1 for $6t+1$ seen as numerator or $(2t+1)(3t+1)$ oe seen as denominator
(e)	-3, -4, -5	2	M1 for $n < -\frac{9}{4}$ oe Or SC1 for answer -3, -4, -5, -6 or answer -2, -3, -4, -5
(f)	50	3	B1 for $x + (x - 12) + (2x - 24) = 112$ oe and B1 for $x = 37$ or M1 correct evaluation of amount for Chuku using <i>their</i> expression and <i>their</i> x
3 (a) (i)	$[\angle PBQ =] 180 - 2a$ or $2(90 - a)$	1	
(ii)	$[\angle APD =] 90 - a$	1	
(iii)	$[\angle DAP =] 2a$	1	
(iv)	$[\angle ADP =] 90 - a$	1	
(b) (i)	3.3	1	
(ii)	30.4[19..]	2	M1 for $4.7 \times \sin 54$ oe

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2016	4024	21

Question	Answers	Mark	Part marks
4 (a)	422 or 423 or 422.4 to 422.6	2	M1 for $\frac{1}{2} \times 4 \times \pi \times (9 - 0.8)^2$ Or SC1 for answer 508.9 to 509.0...
(b)	440 or 440.0 to 440.2	5	B1 for 8.2 used B1 for $\frac{2}{3}\pi r^3$ used M1 for Bowl: $\left[\frac{1}{2}\right]\frac{4}{3} \times \pi \times 9^3 - \left[\frac{1}{2}\right]\frac{4}{3} \times \pi \times (9 - 0.8)^3$ oe M1 for Cylinder: $\pi \times 3.8^2 \times 1.5$
5 (a)	3.76 to 3.77...	2	M1 for $\frac{120}{360} \times 2 \times \pi \times 1.8$ oe
(b)	9.99 to 10.01	3ft	FT <i>their</i> (a) + 6.235[...] M2 for $[OB =] 1.8 \tan 60$ oe or M1 for $\tan 60 = \frac{[\dots]}{1.8}$ oe
(c) (i)	Full calculation, including calculation for $OC = 3.6$ and radius = $TC + OC$ AG	2	M1 for $\cos 60 = \frac{1.8}{OC}$ oe or $OC^2 = 1.8^2 + \text{their } OB^2$
(ii)	2.28	1ft	FT 5.4 – <i>their</i> OB



Page 4	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2016	4024	21

Question	Answers	Mark	Part marks
6 (a)	$[DT =]10.8$ or 10.816 to 10.82	2	M1 for $DT^2 = 6^2 + 9^2$ oe
(b)	139 or 139.2 to 139.3	3	B1 for $BT = 10$ M1 for sum of areas of four triangles seen, with at least 3 of the following correct: $\frac{1}{2} \times 8 \times 6$, $\frac{1}{2} \times 9 \times 6$, $\frac{1}{2} \times 8 \times \text{their } DT$, $\frac{1}{2} \times 9 \times \text{their } BT$
(c)	504	2	M1 for $9 \times 8 \times 5$ or $\frac{1}{3} \times 9 \times 8 \times 6$
(d)	50.7° final answer	3	M1 for finding an acute angle in triangle <i>THG</i> . e.g. $\tan [\dots] = \frac{11}{9}$ or $\tan [\dots] = \frac{9}{11}$ A1 for 50.7[...] [°] or 39.28 to 39.3°
7 (a)	283°	1	
(b)	055°	1	
(c)	$[AB =] 15.4$ or 15.36[...]	3	B1 for $ABC = 74^\circ$ M1 for $\frac{AB}{\sin 51} = \frac{19}{\sin ABC}$
(d)	$[DC =] 20.08$ to 20.1	3	M2 for $[DC^2 =] 19^2 + 27^2 - 2 \times 19 \times 27 \times \cos 48$ or M1 for cosine formula with one error
(e)	Correct working leading to 114 minutes or 1 hour 54 minutes 	4	M1 for $AX = 19 \times \cos 48$ or for $CX = 19 \times \sin 48$ M1 for $DX = 27 - \text{their } AX$ Or for $DX = \sqrt{\text{their } DC^2 - \text{their } CX^2}$ M1 for Time = $216 \times \frac{\text{their } DX}{27}$ oe

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2016	4024	21

Question	Answers	Mark	Part marks
8 (a)	0.2 or 0.21[2...]	1	
(b)	Correct axes Correct shape curve through 9 correct points	B1 B2	B1ft for at least 7 correct points plotted
(c)	Clear, correct, tangent drawn 2.2 to 2.5	M1 A1	
(d) (i)	Ruled line from (−0.4, 0) to (2, 3.6)	1	
(ii)	$y = 1.5x + 0.6$ or $y = \frac{3}{2}x + \frac{3}{5}$	2	B1 for $m = 1.5$ oe or for $c = 0.6$ oe or for correct equation in a different form
(iii)	0 and 3.1 to 3.2	1ft	FT intersections of <i>their</i> ruled line with <i>their</i> curve
(iv)	$A = 2.4$ to 2.6 $B = 1$	1 1	
9 (a)	42	1	
(b)	17	3	B2 for 0.9×1.3 or for answer 117 or B1 for 27×182 or 0.27×182 and M1 for $\frac{\text{their } 4914 - \text{their } 4200}{\text{their } 4200} \times 100$ oe
(c) (i)	$\frac{(30 - y) \times (140 + 4y)}{100}$ oe isw	2	B1 for $(30 - y)$ or $(140 + 4y)$ soi
(ii)	Forms equation $\frac{(30 - y) \times (140 + 4y)}{100} = 40$ then correct working leading to $y^2 + 5y - 50 = 0$ AG	2	B1 FT for $4200 - 140y + 120y - 4y^2 = 4000$ or better FT equating <i>their</i> product from (ii) with 40, eliminating fraction and expanding brackets
(iii)	$y = -10, 5$	3	B2 for $(y + 10)(y - 5)$ or B1 for $(y + a)(y + b)$ where $ab = -50$ or $a + b = 5$ OR B1 for $\sqrt{225}$ soi and B1 for $\frac{-5 \pm \sqrt{\text{their } 225}}{2}$ oe

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2016	4024	21

Question	Answers	Mark	Part marks
(iv)	160 cao	1	
10 (a) (i)	Correct histogram with linear scale on frequency density axis	3	B2 for all 5 heights correct with axis scaled OR B1 for at least 3 correct frequency densities soi and B1 for all 5 bars correct widths
(ii)	39.4[4...]	3	B1 for use of correct midpoints M1 for $\frac{\sum fx}{135}$
(b) (i)	$\frac{33}{95}$ oe	1	
(ii)	$\frac{48}{95}$ oe	2	M1 for $\frac{3}{5} \times \frac{8}{19} + \frac{2}{5} \times \frac{12}{19}$ Or SC1 for answer $\frac{24}{95}$
(iii)	12 cao	1	
(iv)	$\frac{91}{190}$ oe	2	M1 for $\frac{k}{n} \times \frac{k-1}{n-1}$ where $n > k > 1$
11 (a) (i)	13	2	M1 for $\sqrt{(-5)^2 + 12^2}$
(ii) (a)	$[\overrightarrow{BD}] = \overrightarrow{BA} + \overrightarrow{AD} = \begin{pmatrix} 6 \\ -11 \end{pmatrix} + \begin{pmatrix} 0 \\ k \end{pmatrix} = \begin{pmatrix} 6 \\ k-11 \end{pmatrix}$ AG	1	Or $[\overrightarrow{BD}] = \overrightarrow{AD} - \overrightarrow{AB} = \begin{pmatrix} 0 \\ k \end{pmatrix} - \begin{pmatrix} -6 \\ 11 \end{pmatrix} = \begin{pmatrix} 6 \\ k-11 \end{pmatrix}$
(b)	8.5	2	M1 for using $2 \times \begin{pmatrix} 6 \\ k-11 \end{pmatrix} = \begin{pmatrix} 12 \\ -5 \end{pmatrix}$
(c)	4.5	1	or FT their (i) – their k
(b) (i)	Reflection $x = 0$ or y -axis	1 1	

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2016	4024	21

Question	Answers	Mark	Part marks
(ii) (a)	$(3\frac{1}{2}, 1), (7, 2), (8, 2)$	2	B1 for 1 or 2 correct pairs of coordinates
(b)	$\begin{pmatrix} -1 & 3 \\ 0 & 1 \end{pmatrix}$	2	B1 for $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ used or M1 for $\begin{pmatrix} a & b \\ c & d \end{pmatrix} \times \begin{pmatrix} -\frac{1}{2} & -1 & -2 \\ 1 & 2 & 2 \end{pmatrix} = \begin{pmatrix} 3\frac{1}{2} & 7 & 8 \\ 1 & 2 & 2 \end{pmatrix}$



Cambridge International Examinations
Cambridge Ordinary Level

MATHEMATICS (SYLLABUS D)

4024/22

Paper 2

October/November 2016

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2016 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

® IGCSE is the registered trademark of Cambridge International Examinations.

This document consists of **7** printed pages.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2016	4024	22

Question	Answers	Part	Part Marks
1 (a) (i)	3.6	1	
(ii)	109	2	B1 for $756 + 24 \times 922.25$ soi or SC1 for $\frac{24 \times 922.25}{21\,000} \times 100$ oe
(b)	730.25	3	B1 for $\frac{127 \times 21\,000}{100}$ soi M1 for $381 + 36x =$ their total amount oe
(c)	1000	3	M1 for $x + \frac{5x}{100} = 21\,000$ oe and M1 for $21\,000 -$ their 2016 price oe
2 (a)	$\frac{ab}{6}$ Final answer	2	M1 for correct transition to multiplication soi
(b)	$\frac{1}{5}$ oe	2	B1 for $5(h - k)$
(c)	$(3m - 2n)(3m + 2n)$ Final ans.	1	
(d)	$(p - 2)(q - 3)$ oe	2	B1 for $-q(2 - p)$ or $-3(p - 2)$ seen or M1 if brackets removed and rearranged and extraction of p or 2 or for a correct extraction of a common factor after a sign error.
(e) (i)	$2 - \frac{8}{5}$ oe	2	B1 for one correct or
(ii)	-2 -16 cao	2	B1 for either or M1 for $(5x - 1)^2 = 9^2$ or $(x - 2)(x + \frac{8}{5}) = 0$ oe ft or Uses e(i) to form simultaneous equations or $x = \frac{1 \pm 9}{5} \equiv \frac{-B \pm \sqrt{B^2 - 20C}}{10}$

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2016	4024	22

Question	Answers	Part	Part Marks
3 (a)	3.75	1	
(b)	Correct curve ft	2ft	B1 for 4 correct plots ft
(c)	(0.3 to 0.5) ft	2ft	M1 for a reasonable tangent at $x = 2.5$
(d)	0 cao (3.05 to 3.25) ft	2ft	B1 for either
(e) (i)	$y = 4 - x$	2	M1 for $x^3 + 10x - 80 = 0 \equiv \frac{x}{20}(x^2 - 10) = ax + b$ oe
(ii)	L drawn on the grid ft	1ft	Dependent on at least 1 mark in (e)(i).
(iii)	(3.55) ft	1ft	Dependent on at least 1 mark in (e)(i).
4 (a) (i)	2.67	2	M1 $\frac{AD}{3} = \cos 27$ oe
(ii)	4.57	3	M2 for $CD = \frac{3}{\sin 41}$ oe or M1 for $\frac{3}{CD} = \sin 41$ oe
(b)	53.1 126.9	3	M1 for $\frac{1}{2} \times 3 \times 5 \times \sin \hat{PQR} = 6$ oe and A1 for 53.1 or SC1 for supplementary angles from $\sin \hat{PQR} = k$.
5 (a)	TAB ATB Statement mentions tangent and radius ABT	2	B1 for 2 pairs of equal angles.
(b)	2.1	3	M1 for $\frac{AC}{AB} = \frac{CD}{BT}$ oe soi and M1 for $\frac{7}{10} = \frac{CD}{3}$ oe OR B1 for $(AB =) 10$

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2016	4024	22

Question	Answers	Part	Part Marks
6 (a)	$\begin{pmatrix} 4 & 4 \\ 1 & 7 \end{pmatrix}$	2	B1 for 3 entries correct.
(b)	$\begin{pmatrix} 2 & 4 \\ 2 & 9 \end{pmatrix}$	2	B1 for 3 entries correct.
(c)	4 7	2	B1 for one correct or $\begin{pmatrix} 2x \\ 3x+2 \end{pmatrix}$ seen
(d)	$\frac{1}{5}\begin{pmatrix} 3 & -2 \\ 1 & 1 \end{pmatrix}$ oe isw	2	B1 for $\det \mathbf{B} = 5$ soi or $\begin{pmatrix} 3 & -2 \\ 1 & 1 \end{pmatrix}$ soi
7 (a) (i)	1.98	1	
(ii)	$(\pm)\sqrt{x^2 - a^2}$ Final answer	2	M1 for $x^2 = a^2 + b^2$ oe
(b) (i)	$(PQ) = \frac{17}{x+5}$	1	
(ii)	$3x^2 + 15x - 85 (=0)$ oe shown	3	M1 for $(AB) = \text{their}(PQ) + 3$ and M1 for $(\text{their}(PQ) + 3) \times x = 17$ or
(iii)	3.38 -8.38	3	B1 for $\sqrt{15^2 - 4 \times 3 \times (-85)}$ soi and B1 for $\frac{-15 \pm \sqrt{\text{their}1245}}{2 \times 3}$ soi and M1 for both real values of $\frac{p \pm \sqrt{q}}{r}$
(iv)	20.8	2ft	M1 for $\text{their}(PQ)$ and $x + 5$ evaluated using $x =$ the positive root from (b)(iii). or for their perimeter in algebraic form

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2016	4024	22

Question	Answers	Part	Part Marks
8 (a) (i)	Dependent on 4 fig. term calculated using any version of π .	3	M1 for arc length $\frac{48}{360} \times 2\pi R$ soi and M1 for $R = 20 \times \frac{360}{48} \times \frac{1}{2\pi}$ oe
(ii)	239	2	M1 for $\frac{48}{360} \times \pi R^2$
(iii)	20.7	2	M1 for $2\pi r = \frac{312}{360} \times 2\pi R$ oe
(b) (i)	200	3	M1 for $l^2 = 4^2 + 7.5^2$ oe soi and A1 for ($l =$) 8.5
(ii)	2.5	2	B1 for 8 : 5 soi
9 (a)	326 ft	4ft	M2 for $65^2 = 110^2 + 70^2 - 2 \times 110 \times 70 \times \cos \hat{ACB}$ soi or M1 for the cosine rule with one error. and A1 for 33.9 or 146.1 or 59.2 and B1 ft for 360 – their $\hat{ACB}$ oe SC 2 for 109.1 or 37.0
(b)	92.2	3	M2 for $\frac{AD}{\sin(70 + 58) \text{ or } (180 - (70 + 58))} = \frac{110}{\sin 70}$ oe soi or M1 for $70 + 58$ or $180 - (70 + 58)$
(c) (i)	13.6 or 13.7	2	M1 for $\tan YBC = \frac{17}{70}$ or $\tan BYC = \frac{70}{17}$
(ii)	16.5	3	M1 for Figs $\frac{110}{24}$ soi and B1 for $\times$ by $\frac{60 \times 60}{1000}$ oe soi

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2016	4024	22

Question	Answers	Part	Part Marks
10 (a) (i)	$6b - 3a$ oe isw	1	
(ii)	$2b - a$ oe isw	1ft	
(iii)	$2 : 3$ cao NB www	4	M1+ M1 for two of $\overrightarrow{OC} = \overrightarrow{OA} + \overrightarrow{AC}$ $\overrightarrow{CD} = \overrightarrow{CB} + \overrightarrow{BD}$ $\overrightarrow{OD} = \overrightarrow{OB} + \overrightarrow{BD}$ A1 for $\overrightarrow{OC} = 2a + 2b$ ft or $\overrightarrow{CD} = 3a + 3b$ ft or $\overrightarrow{OD} = 5a + 5b$
(b) (i)	Reflection $y = -x$ oe	2	B1 for either
(ii) (a)	Triangle C with vertices (2, 3), (2, 2), (5, 5)	2	B1 for two vertices correct or M1 for a correct construction line involving H(2, 1) or H(2, 0)
(b)	1	1	
(c)	$\begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$	1ft	

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge O Level – October/November 2016	4024	22

Question	Answers	Part	Part Marks
11 (a) (i) (a)	40 to 41	1	B1 for 52 ± 1 or 27 ± 1
(b)	23 to 27	2	
(c)	225 to 245	1	
(ii)	79 to 80	1	
(iii)	Paper 1 e.g. Paper 2 has median 54 oe Using (i)(a), (i)(c) or (ii) with numerical justification – accept reasonable attempts to read the graphs correctly.	1	
(b) (i)	$\frac{2}{4}$ oe	1	B1 for $\frac{3}{5} \times \frac{2}{4}$ or $\frac{2}{5} \times \frac{3}{4}$ seen
(ii)	$\frac{2}{20}$ oe	1	
(iii)	$\frac{12}{20}$ oe	2	
(iv)	$\frac{18}{60}$ oe	2	



Cambridge Assessment International Education
Cambridge Ordinary Level

MATHEMATICS (SYLLABUS D)

4024/21

Paper 2

October/November 2017

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

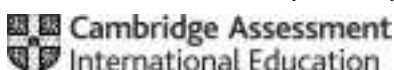
Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2017 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

© IGCSE is a registered trademark.

This document consists of **6** printed pages.



Abbreviations

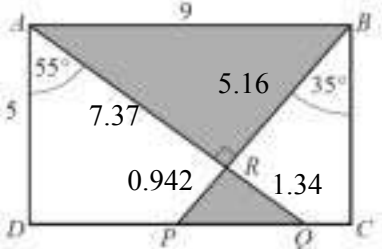
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	503.5[0] final answer	3	M2 for $12.50 \times 38 \times 1.06$ oe or $12.50 \times 38 \times 0.06$ oe or M1 for 12.50×38 or 12.50×1.06 oe soi or 12.50×0.06 oe soi
1(a)(ii)	12	2	M1 for $(525 - 462) \div 525$ oe After M0 , SC1 for answer 88
1(a)(iii)	2400 nfw	2	M1 for $1.03x = 2472$ soi
1(b)	192	3	M1 for 520×0.74 M1 for $(\text{their } 384.8 - 260) \div 0.65$
2(a)	14.35 or 14.4	3	B1 for use of correct midpoints soi M1 for $(2.5 \times 35 + 7.5 \times 42 + 15 \times 30 + 25 \times 28 + 40 \times 15) \div 150$
2(b)	Correct histogram with linear scale on frequency density axis	3	B2 for all 5 bar heights correct with frequency density axis scaled OR B1 for at least 3 correct heights drawn or 3 correct frequency densities calculated B1 for 5 bars correct width and position
2(c)	18 to 20	2	M1 for $(15 + 14) \div 150$
3(a)	040	1	
3(b)	$BC = \sqrt{25^2 + 38^2 - 2 \times 25 \times 38 \cos(360 - 220)}$	M2	or M1 for $25^2 + 38^2 - 2 \times 25 \times 38 \times \cos(360 - 220)$
	$BC = 59.36$ to 59.37	A1	

Question	Answer	Marks	Partial Marks
3(c)	204.1 to 204.3[2...]	4	B3 for 24.1 to 24.3[2...] OR M2 for $\sin B = \frac{38 \times \sin(360 - 220)}{59.4}$ or M1 for $\frac{\sin B}{38} = \frac{\sin(360 - 220)}{59.4}$ and M1 for $180 + \text{their } B$
4(a)	$\frac{5}{9}$ oe	1	
4(b)(i)	$\frac{25}{81}$ oe	1	
4(b)(ii)	$\frac{40}{81}$ oe	2	M1 for $\frac{\text{their } 5}{9} \times \frac{(9 - \text{their } 5)}{9}$ soi or $\frac{\text{their } 5}{9} \times \frac{4}{9}$
4(c)	$\frac{4}{9}$ oe nfw	3	M2 for $\frac{5}{9} \times \frac{4}{8} + \frac{4}{9} \times \frac{3}{8}$ or M1 for $\frac{4}{9} \times \frac{3}{8}$ or $\frac{5}{9} \times \frac{4}{8}$
5(a)	-3 , 2 nfw	3	M1 for $y^2 + 5y = 4y + 6$ M1 for $(y + 3)(y - 2) [= 0]$
5(b)	$t = \frac{2p-1}{4+p}$ or $t = \frac{1-2p}{-4-p}$ final answer	3	M1 for $p(2 - t) = 4t + 1$ or better M1FT for $2p - 1 = 4t + pt$ M1FT for completion to explicit formula for t Max 2 marks if final answer incorrect
5(c)	$\frac{3x-2}{x+4}$ final answer	3	B1 for $(3x - 2)(x - 4)$ seen B1 for $(x + 4)(x - 4)$ seen
6(a)(i)	$[\hat{ACB}] = 38$	1	
6(a)(ii)	$[\hat{AEF}] = 38$, angles in same segment are equal	1	Strict FT <i>their</i> (i)
6(a)(iii)	$[\hat{CDE}] = 112$	1	
6(a)(iv)	$[\hat{BCD}] = 106$	2	FT $180 - \text{their } CDE + \text{their } ACB$ M1 for $\hat{ACD} = 180 - \text{their } 112$ soi

Question	Answer	Marks	Partial Marks
6(b)	156	3	B1 for sum of angles in pentagon = 540 soi M1 for $8x + 124 = \text{their } 540$ oe
6(c)	105.5	2	B1 for two of 65.5, 131.5 and 57.5 seen After B0 , SC1 for answer 108.5
7(a)(i)	$y = -2x + 5$ oe	2	B1 for $y = -2x + c$ oe or for $y = mx + 5$ oe or M1 for gradient = $\frac{5+3}{0-4}$ oe
7(a)(ii)	$y = -2x - 1$ oe FT <i>their</i> gradient from (a)(i)	2	B1 for answer $y = \text{their } (-2)x + k$, where $k \neq \text{their } 5$ or M1 for $3 = \text{their } (-2) \times -2 + k$ oe
7(b)(i)	3.5	1	
7(b)(ii)	Correct smooth curve through 8 correct points	3	B2FT for 7 or 8 points correctly plotted or B1FT for 5 or 6 points correctly plotted
7(b)(iii)	Clear correct tangent drawn at (1, 1)	M1	
	-2.4 to -1.6	A1	
7(b)(iv)	0.6 to 0.8 and 4.2 to 4.4	2	FT reading from <i>their</i> graph at $y = 2$ B1 for one correct or for $y = 2$ soi
8(a)	$[x^2 =] 6^2 + 12^2$	M1	or $[x =] \sqrt{6^2 + 12^2}$
	$[x =] 13.41[6\dots]$ or 13.42	A1	
8(b)	478.7 to 479.4	3	M1 for $\left[\frac{1}{2} \times\right] 4 \times \pi \times 6^2$ seen M1 for $\pi \times 6 \times 13.4$ seen After 0 scored, SC1 for consistent use of $r = 3$ in formula for [hemi]sphere and cone
8(c)	904.7 to 905 nfw	3	M1 for $\left[\frac{1}{2} \times\right] \frac{4}{3} \times \pi \times 6^3$ seen M1 for $\frac{1}{3} \times \pi \times 6^2 \times 12$ seen After 0 scored, SC1 for consistent use of $r = 3$ in formula for [hemi]sphere and cone
8(d)(i)	4310 or FT $9 \times \text{their } (b)$	2	M1 for $\left(\frac{6}{2}\right)^2$ soi
8(d)(ii)	113 or FT $\frac{1}{8} \times \text{their } (c)$	2	M1 for $\left(\frac{1}{2}\right)^3$ soi

Question	Answer	Marks	Partial Marks
9(a)	7 cao	2	M1 for $\frac{12}{3000} \times 1750$ oe
9(b)(i)	$\frac{2500}{x}$	1	
9(b)(ii)	$\frac{2500}{x} - \frac{2500}{x+20} = 15$	M1	Or equivalent unsimplified equation
	$2500(x+20) - 2500x = 15x(x+20)$	M1	FT elimination of <i>their</i> fractions with algebraic denominators
	Correct simplification leading to $3x^2 + 60x - 10\,000 = 0$ AG	A1	
9(b)(iii)	48.59 and –68.59 final answer	3	B1 for $\sqrt{60^2 - 4 \times 3 \times -10000}$ soi B1 for $\frac{-60 \pm \sqrt{\text{their } 123600}}{2 \times 3}$
9(b)(iv)	36 minutes 27 seconds	3	M2 for $\frac{2500}{\text{their } 48.59 + 20}$ or M1 for $\frac{2500}{\text{their } 48.59}$
10(a)(i)	Triangle <i>B</i> at (2, –3), (3, –3), (3, –5)	2	B1 for translation of correct triangle <i>B</i>
10(a)(ii)	Triangle <i>C</i> at (3, 3), (3, 9), (6, 3)	2	B1 for two vertices correct or for $\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} 1 & 2 & 1 \\ 1 & 1 & 3 \end{pmatrix}$ oe
10(a)(iii)	$\begin{pmatrix} \frac{1}{3} & 0 \\ 0 & \frac{1}{3} \end{pmatrix}$ oe	1	
10(a)(iv)	Enlargement Centre (3, –1.5) SF $-\frac{1}{3}$	3	B1 for each
10(b)(i)	$\begin{pmatrix} 4 \\ 8 \end{pmatrix}$	2	B1 for one component correct or M1 for $2 \begin{pmatrix} 6 \\ 3 \end{pmatrix} - \begin{pmatrix} 8 \\ -2 \end{pmatrix}$ oe After 0 scored, SC1 for answer $\begin{pmatrix} -4 \\ -8 \end{pmatrix}$
10(b)(ii)	$\begin{pmatrix} 9 \\ 0 \end{pmatrix}$	2	B1 for one component correct or M1 for $-\frac{3}{4}(\text{their } \overline{SR})$ or $\frac{1}{4}(\text{their } \overline{SR})$ soi

Question	Answer	Marks	Partial Marks
11(a)	$\angle ARB = \angle PRQ$, [vertically] opposite $\angle RAB = \angle RQP$, alternate [angles] $\angle RBA = \angle RPQ$ alternate [angles] $\triangle ARB$ and $\triangle QRP$ similar, equal angles	3	B1 for one pair of angles stated with reason or for two pairs with no reasons or incorrect reasons B1 for a further correct pair of angles with reason
11(b)(i)	$[AQ =] 8.72$ or $8.717[...]$	2	M1 for $\cos 55 = \frac{5}{AQ}$ or $\sin 35 = \frac{5}{AQ}$ oe
11(b)(ii)	$[AR =] 7.37[2...]$	2	M1 for $\cos 35 = \frac{AR}{9}$ or $\sin 55 = \frac{AR}{9}$ oe
11(b)(iii)	$[\text{Area } ARB =] 18.8$ to $19.2[...]$ or FT <i>their AR</i>	2	M1 for $\frac{1}{2} \times \text{their } 7.37 \times 9 \times \sin 35$ oe Or $\frac{1}{2} \times \text{their } 7.37 \times \sqrt{9^2 - (\text{their } 7.37)^2}$
11(b)(iv)	19.6 to 19.7 nfw 	3	M1 for $\tan 35 = \frac{PR}{\text{their } RQ}$ oe or $\frac{PR}{\text{their } RQ} = \frac{\text{their } RB}{\text{their } AR}$ oe where $\text{their } RQ = (\text{their } 8.72 - \text{their } 7.37)$ M1 for $\text{their area } ARB +$ $\frac{1}{2} \times \text{their } RQ \times \text{their } PR$



Cambridge Assessment International Education
Cambridge Ordinary Level

MATHEMATICS (SYLLABUS D)

4042/22

Paper 2

October/November 2017

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

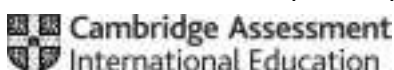
Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2017 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

© IGCSE is a registered trademark.

This document consists of **8** printed pages.



Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	A by 240	4	B3 for 4980 and 5220 seen or difference = 240 Or M1 for $4500 \div 5$ and 12×340 oe and M1 for 0.12×4500 and 24×195 oe and M1 for the difference between <i>their</i> 5220 and <i>their</i> 4980
1(b)	10.61 cao	3	M2 for $240 \div 100 \times 5.2 \times 0.85$ soi Or M1 for $240 \div 100 \times 5.2$ or <i>their</i> 12.48×0.85 or 5.2×0.85
1(c)	42	3	B2 for 280 Or M1 for $1.15x = 322$ soi and M1 for $322 - \text{their } 280$
2(a)(i)	12 40 85 107	1	
2(a)(ii)	Correct cumulative frequency curve	2	B1FT for at least 5 correct plots
2(b)(i)	47 to 49	1FT	
2(b)(ii)	28 to 32	2FT	B1 for 63 to 65 or 32 to 35

Question	Answer	Marks	Partial Marks
2(c)	49.3	3	M1 for $(12 \times 10 + 28 \times 30 + 45 \times 50 + 22 \times 70 + 13 \times 90)$ and B1 dep for <i>their</i> $\Sigma fx \div 120$
3(a)	$\begin{pmatrix} 5 \\ 6 \\ 8 \end{pmatrix}$ cao	1	
3(b)(i)	$\begin{pmatrix} 440 \\ 540 \end{pmatrix}$ cao	2	B1 for one element correct
3(b)(ii)	The amount Anya makes for men's T-shirts and women's T-shirts	1	
3(c)(i)	$(290 \quad 630 \quad 537.5[0])$	2	B1 for two correct values seen in a row of 3 elements or column of 3 elements isw
3(c)(ii)	48.7%	3	M1FT for <i>their</i> $(440 + 540)$ and <i>their</i> $(290 + 630 + 537.5)$ and M1 for $(\text{their } 1457.5 - \text{their } 980) \div \text{their } 980$ oe
4(a)(i)	Triangle <i>B</i> at $(4, -1), (4, -4), (5, -4)$	2	B1 For triangle <i>B</i> the correct size and orientation
4(a)(ii)	Triangle <i>C</i> at $(1, 4), (3, 4), (3, -2)$	2	B1 for correct size and orientation, incorrect position or for triangle with two vertices correct or for triangle at $(-3, 0), (-5, 0), (-5, 6)$
4(b)(i)	Triangle <i>Q</i> at $(3, 1), (9, 1), (6, 3)$	2	B1 for coordinates $(3, 1), (9, 1)$ and $(6, 3)$ soi or for triangle with two vertices correct
4(b)(ii)	(Stretch) factor 3 <i>y</i> -axis invariant or parallel to <i>x</i> -axis	2	B1 for either

Question	Answer	Marks	Partial Marks
5(a)	$\frac{14-x}{(x-2)(x+1)}$ Final answer	2	M1 for $\frac{4(x+1)-5(x-2)}{(x-2)(x+1)}$ or better soi
5(b)	-4 or 1.5 oe	3	B1 for $2x^2 + 5x - 12 [= 0]$ and M1 for $(2x - 3)(x + 4) [= 0]$ OR M1 for FT factorising their 3-term quadratic equation Or for correct FT substitution into formula oe and A1FT for solutions from their quadratic equation
5(c)(i)	$3p + 2n = 4.8[0]$ or $3p + 2n = 480$ $5p + 4n = 9[.00]$ or $5p + 4n = 900$	1	
5(c)(ii)	0.6[0] 1.5[0]	3FT	M1 for a correct method to eliminate one variable A1 for either $p = 0.6[0]$ or $n = 1.5[0]$ www After A0 , B1FT for a correct substitution to find the other variable After 0 , SC1 for a pair of values that satisfy either equation
6(a)(i)	1	1	
6(a)(ii)	10, 12, 14, 15, 16, 18, 20	1	
6(a)(iii)	$\frac{7}{11}$ oe	1	
6(b)(i)	8	2	M1 for $14 + 10 + 24 - x = 40$ oe or for correct Venn diagram with algebraic expressions. Or B1 for Venn diagram with at least 3 numbers correct

Question	Answer	Marks	Partial Marks
6(b)(ii)	$\frac{28}{45}$ oe	2FT	M1 for $\frac{\text{their } 8}{k} \times \frac{\text{their } 7}{k-1} [\times 2]$ where $k > \text{their } 8$ Or SC1 for $\left(\frac{\text{their } 8}{10}\right)^2$
7(a)(i)	–4.5 –4.5	1	Both correct
7(a)(ii)	Correct smooth curve	3FT	B2FT for 8 or 9 points correctly plotted Or B1FT for 6 or 7 points correctly plotted Or B1 for the correct scales drawn
7(a)(iii)	–2.4 to –1.6 dependent on tangent drawn	2	Accept a correctly formed $\Delta y \div \Delta x$ isw B1 for tangent drawn at (3, 1.5)
7(a)(iv)(a)	–2 cao		
7(a)(iv)(b)	–2.4 to –2.3 and 4.3 to 4.4		FT reading their graph at $y = \text{their } -2$ Tolerance ± 1 small square B1 FT for one correct
7(b)(i)	4	1	
7(b)(ii)	3	1	
7(b)(iii)	324	1	
8(a)(i)	$\frac{y}{2}$ oe angle at centre = twice angle at circumference oe	2	B1 for $\frac{y}{2}$
8(a)(ii)	90 – y oe [Angle between] radius and tangent = 90°, [sum of angles in a triangle]	2	B1 for 90 – y

Question	Answer	Marks	Partial Marks
8(a)(iii)	$2y$ oe or $2(90 - \text{their (a)(ii)})$ or $180 - 2 \text{ their (a)(ii)}$ Angle in semicircle = 90°	2FT	FT dependent on expressions in y B1 for $2y$
8(b)	<i>EFC</i>	1	
8(c)	Any two of $\angle OCG$ is common oe $\angle ADC = \angle OGC [= 90^\circ]$ $\angle DAC = \angle GOC [= y]$ with no incorrect reason or fact stated	2	B1 for one pair of angles
8(d)	Trapezium	1	
8(e)(i)	$1 : 4$ oe	1	
8(e)(ii)	$1 : 8$ oe	1	
9(a)	7.54	2	M1 for $\pi \times 0.4^2 \times 15$
9(b)	53.7	4	M1 for $\frac{1}{2} \times 4.5^2 \times \sin 110$ oe M1 for $\frac{250}{360} \times \pi \times 4.5^2$ or $\frac{110}{360} \times \pi \times 4.5^2$ M1 for <i>their</i> 9.514 + <i>their</i> 44.18 oe
9(c)	2 minutes 20 seconds	2	M1 for figs $175 \div 45$ soi

Question	Answer	Marks	Partial Marks
9(d)	146.5°	4	B3 for 33.5° Or M2 for $\sin Q = \frac{450 \sin 62}{720}$ Or M1 for $\frac{\sin Q}{450} = \frac{\sin 62}{720}$ AND M1 for 180 – <i>their</i> Q
10(a)	$3x^2 + 16x - 460 = 0$ correctly derived	4	B1 for $(x + 4)(3x + 4)$ oe and M1 for expanding brackets and collecting like terms and M1 for <i>their</i> area = 476 and A1 for correct simplification leading to $3x^2 + 16x - 460 = 0$
10(b)	10 and $-\frac{46}{3}$ oe (–15.3)	3	B2 for $(x - 10)(3x + 46)$ Or M1 for such as $(x + a)(3x + b)$ with $ab = -460$ or $3a + b = 16$ A1FT for solutions from their factors
10(c)	[Height =] 14 [Length =] 34	2FT	B1FT for either, or for both correct but in the wrong places
10(d)	61.6 or 16(their +ve root + 1)×0.35	3FT	M2 for $(\text{their } 476 - \text{their } 10 \times \text{their } 30) \times 0.5 \times 0.7$ oe Or M1 for $\text{their } 476 - \text{their } 10 \times \text{their } 30$ oe

Question	Answer	Marks	Partial Marks
11(a)	Need to see 2.58 rounded from a correctly obtained 2 581 or better.	3	Method 1 M2 for $AY = 3.65 \cos 45$ or $(3.65 \div 2) \div \sin 45$ or M1 for e.g. $\frac{AY}{3.65} = \cos 45$ or $\sin 45 = \frac{3.65 \div 2}{AY}$ Method 2 M1 for such as $AY^2 + AY^2 = 3.65^2$ or $3.65^2 + 3.65^2 = AC^2$ so M1 for $AY^2 = \frac{3.65^2}{2}$ oe A1 for $AY = 2.580[9\dots]$
11(b)	7.93	2	M1 for $7.5^2 + 2.58^2$
11(c)	26.6° or $2 \sin^{-1} \left(\frac{0.5 \times 3.65}{\text{their } 7.93} \right)$	3FT	M2 for $2 \sin^{-1} \left(\frac{0.5 \times 3.65}{\text{their } 7.93} \right)$ or $\cos [\dots] = \frac{\text{their } 7.93^2 + \text{their } 7.93^2 - 3.65^2}{2 \times \text{their } 7.93^2}$ Or M1 for $\sin [\dots] = \frac{0.5 \times 3.65}{\text{their } 7.93}$ or $3.65^2 = \text{their } 7.93^2 + \text{their } 7.93^2 - 2 \times \text{their } 7.93^2 \times \cos [\dots]$
11(d)(i)	11.18 or 11.2	2	M1 for $\tan 77 = \frac{XY}{2.58}$ oe
11(d)(ii)	80.7°	2FT	M1 for $\tan [\dots] = \frac{\text{their } 11.2}{3.65 \div 2}$



MATHEMATICS (SYLLABUS D)

4024/21

Paper 2 Paper 2

October/November 2018

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **8** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

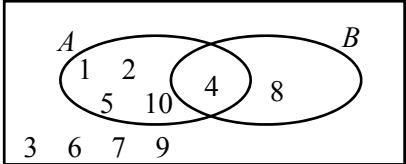
Abbreviations

cao	correct answer only
soi	seen or implied
isw	ignore subsequent working
oe	or equivalent
nfw	not from wrong working
dep	dependent
AG	answer given

Question	Answer	Marks	Partial Marks
1(a)(i)	6 points plotted correctly	2	B1 for 4 or 5 points plotted correctly
1(a)(ii)	Positive	1	
1(a)(iii)	$\frac{3}{5}$ cao	2	B1 for $\frac{6}{10}$ oe seen
1(a)(iv)	Ruled line of best fit	B1	
1(a)(v)	54 to 58	B1	FT reading from <i>their</i> straight line of best fit at 48 km
1(b)(i)	$20 < t \leq 40$	1	
1(b)(ii)	39.5	3	B1 for correct use of midpoints soi M1 for $(10 \times 29 + 30 \times 38 + 50 \times 26 + 70 \times 21 + 90 \times 6) \div 120$ oe
1(b)(iii)	22.5	2	B1 for 21 + 6 or 27 seen

Question	Answer	Marks	Partial Marks
2(a)	395.25 cao	3	B2 for answer 79.05 OR B1 for [time =] 7.75 oe soi M1 for <i>their</i> 7.75×10.20 oe
2(b)	23.75	2	M1 for $(19.80 \times 25 - 400) \div 400$ oe If 0 scored, SC1 for answer 123.75 or 123.8
2(c)	14.5[0]	2	M1 for $\frac{(100+8)}{100}x = 15.66$ soi
2(d)	3744.14 final answer	3	M2 for $3500 \times \left(1 + \frac{1.7}{100}\right)^4$ oe or M1 for $3500 \times \left(1 + \frac{1.7}{100}\right)^k$ oe where $k > 1$

Question	Answer	Marks	Partial Marks
3(a)	$\cos A = \frac{95^2 + 174^2 - 132^2}{2 \times 95 \times 174}$	M2	or M1 for $132^2 = 95^2 + 174^2 - 2 \times 95 \times 174 \times \cos A$
	$A = 48.56[7\dots]$ or 48.57	A1	
3(b)	1580 to 1581	4	M1 for $\frac{1}{2} \times 95 \times 174 \times \sin 48.6$ AND M2 for <i>their</i> area $\times 3 \div 100 \times 8.50$ or M1 for two operations correct in <i>their</i> area $\times 3 \div 100 \times 8.50$ or for $3 \div 100 \times 8.50$ soi

Question	Answer	Marks	Partial Marks
4(a)(i)		2	B1 for 8 or 9 numbers correctly placed or for 1, 2, 4, 5, 8, 10 correctly placed with no numbers placed incorrectly
4(a)(ii)	6	1	FT $n(A \cup B)$ from <i>their</i> Venn diagram
4(a)(iii)	Factors of 10 oe	1	
4(b)(i)	10	2	B1 for Venn diagram with at least 3 numbers correct Or M1 for $30 = 8 + 12 + x$ oe
4(b)(ii)	$\frac{42}{870}$ or $\frac{7}{145}$ oe	2	M1 for $\frac{\text{their } 7}{30} \times \frac{\text{their } 6}{29} [\times 2]$ or SC1 for answer $\frac{49}{900}$ oe , FT <i>their</i> Venn diagram

Question	Answer	Marks	Partial Marks
5(a)	-1.6 oe	1	
5(b)	Correct smooth curve	3	B2FT for 7 or 8 points correctly plotted or B1FT for 5 or 6 points correctly plotted
5(c)(i)	Tangent drawn at (-2, 0.8)	B1	
5(c)(ii)	-3.1 to -2.2	B1	Dependent on tangent drawn at $x = -2$
5(d)	-2.5 to -2.3 1.4 to 1.6 2.7 to 2.9	3	FT reading <i>their</i> graph at $y = 2$ Tolerance ± 1 mm B1 for each one correct After 0 scored, SC1 for $y = 2$ soi

Question	Answer	Marks	Partial Marks
6(a)	$\angle TAO = \angle TCO$ tangent perpendicular to radius $AO = CO$ [equal] radii TO is common Congruent RHS	3	B1 for one correct pair of equal angles and one correct pair of equal sides or for two correct pairs of equal sides B1 for correct reason for two pairs of equal sides/angles
6(b)(i)	$90 - x$	1	
6(b)(ii)	$\frac{90 - x}{2}$ oe	1	FT <i>their</i> algebraic (b)(ii) $\div 2$
6(b)(iii)	$270 - x$	1	
6(c)	16.5 or 16.46[...]	3	M2 for $[OT =] \frac{6}{\sin 35}$ or M1 for $\sin 35 = \frac{6}{[OT]}$

Question	Answer	Marks	Partial Marks
7(a)	$\begin{pmatrix} 2 \\ 4 \end{pmatrix}$	1	
7(b)	6.71 or 6.708...	2	M1 for $6^2 + (-3)^2$ oe
7(c)	(0, 5)	2	FT <i>their (a)</i> ((<i>their</i> 2 – 2), (<i>their</i> 4 + 1)) B1 for one value in coordinates correct or for $\begin{bmatrix} \overline{CB} \end{bmatrix} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$ soi
7(d)(i)	$y = -\frac{1}{2}x + 4$ oe final answer	3	B2 for $y = -\frac{1}{2}x + c$ oe OR M1 for gradient = $-\frac{3}{6}$ soi M1 for (–2, 5) substituted into $y = \text{their } mx + c$
7(d)(ii)	$y = 2x$ oe	1	FT <i>their</i> gradient from (d)(i)

Question	Answer	Marks	Partial Marks
8(a)	$n + 5$ $n + 10$	1	Both correct
8(b)(i)	$(n + 5)^2$ and $n(n + 10)$	M1	
8(b)(ii)	$n^2 + 5n + 5n + 25 - n^2 - 10n = 25$	A1	or $n^2 + 10n - n^2 - 5n - 5n - 25 = -25$
8(c)	63	3	M1 for $n + n + 5 + n + 10 = 174$ oe A1 for $n = 53$ If 0 scored, SC1 for answer 53

Question	Answer	Marks	Partial Marks
9(a)(i)	$\pi \times 3^2 \times 21 + \frac{2}{3} \times \pi \times 3^3$	M3	B1 for cylinder height = 21 soi M1 for $\pi \times 3^2 \times$ <i>their</i> height M1 for $\frac{2}{3} \times \pi \times 3^3$
	= 650.3[...] or 650.4	A1	
9(a)(ii)	452 or 452.3 to 452.4...	3	M2 for $2 \times \pi \times 3^2 + \pi \times 6 \times 21$ or M1 for $2 \times \pi \times 3^2$ or $\pi \times 6 \times 21$
9(a)(iii)	21.2 or 21.22 to 21.23...	2	B1 for $\sqrt[3]{\frac{450}{650}}$ soi or $\sqrt[3]{\frac{650}{450}}$ soi
9(b)	1.57	3	B1 for 4.25 or 335 used M1 for <i>their</i> $4.25 - 8 \times$ <i>their</i> $335 \div 1000$ or for <i>their</i> $4250 - 8 \times$ <i>their</i> 335

Question	Answer	Marks	Partial Marks
10(a)(i)	$\frac{1}{2}x(x-4) \times 15 = 440$	M2	B1 for height = $(x-4)$
10(a)(ii)	Correct expansion and simplification leading to $3x^2 - 12x - 176 = 0$	A1	
10(b)(i)	$\frac{-(-12) \pm \sqrt{(-12)^2 - 4 \times 3 \times -176}}{2 \times 3}$	B2	B1 for $\sqrt{(-12)^2 - 4 \times 3 \times -176}$ or for $\frac{-(-12) \pm \sqrt{\text{their } 2256}}{2 \times 3}$
10(b)(ii)	9.92 and -5.92	B1	
10(c)	5.92	1	FT (<i>their</i> positive root - 4) if result positive
10(d)	18.2 or 18.21 to 18.22...	4	M2 for $[AF =]\sqrt{15^2 + \text{their } 9.92^2}$ Or for $[BF =]$ $\sqrt{\text{their } 9.92^2 + \text{their } 5.92^2 + 15^2}$ oe or M1 for $AF^2 = 15^2 + \text{their } 9.92^2$ soi or for $BF^2 = \text{their } 9.92^2 + \text{their } 5.92^2 + 15^2$ oe AND M1 for $\tan [AFB] = \frac{\text{their } 5.92}{\text{their } 17.98}$ or $\sin [AFB] = \frac{\text{their } 5.92}{\text{their } 18.93}$

Question	Answer	Marks	Partial Marks
11(a)	$\frac{1-2x}{(2x-3)(x-2)}$ or $\frac{1-2x}{2x^2-7x+6}$ final answer	3	B1 for $4(x-2) - 3(2x-3)$ oe isw B1 for denominator $(2x-3)(x-2)$ oe isw
11(b)	$\frac{2x-3}{x-5}$ final answer nfw	3	B1 for $(2x+3)(2x-3)$ seen B1 for $(2x+3)(x-5)$ seen



MATHEMATICS (SYLLABUS D)

4024/22

Paper 2

October/November 2018

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **8** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

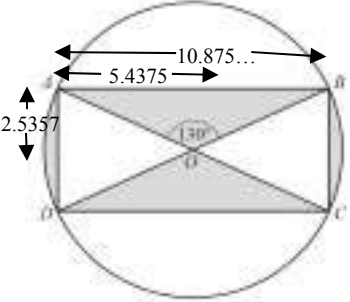
Question	Answer	Marks	Partial Marks
1(a)	23 068.5[0]	3	M1 for $32\,500 \times 0.91$ oe M1 for <i>their</i> $29\,575 \times 0.78$ oe
1(b)	1311.96 cao	3	M2 for $1200 \times \left(1 + \frac{1.8}{100}\right)^5$ oe or M1 for $1200 \times \left(1 + \frac{1.8}{100}\right)^k$ oe where $k > 1$
1(c)	750	3	M2 for $\left(\frac{100 + 5 \times 2.1}{100}\right)x = 828.75$ soi or B1 for $5 \times 2.1[\%]$ or better soi
1(d)	181.5[0]	3	M2 for $(275 - 79.20 \div 0.72) \times 1.10$ oe or M1 for $79.20 \div 0.72$ oe or $(275 - \text{their } 110) \times 1.10$ oe

Question	Answer	Marks	Partial Marks
2(a)	Correct cumulative frequency curve	2	B1 for at least 5 correct plots
2(b)(i)	118 to 120	1	
2(b)(ii)	14 to 18 nfw	2	M1 for reading at CF 150 or 50
2(c)	On average Lim's tomatoes had lower masses oe	B1	Strict FT their median
	Masses of Ravi's tomatoes were more consistent oe	B1	Strict FT their IQR
2(d)(i)	46, 26	1	
2(d)(ii)	$110 < m \leq 120$	1	FT their frequency table

Question	Answer	Marks	Partial Marks
2(d)(iii)	118.8	3	B1 for correct use of midpoints soi M1 for (20×90 + 28×105 + 64×115 + <i>their</i> 46×125 + <i>their</i> 26×135 + 16×150) ÷ 200 oe

Question	Answer	Marks	Partial Marks
3(a)	$\frac{23-2y}{(y-1)(y+6)}$ or $\frac{23-2y}{y^2+5y-6}$ final answer	3	B1 for $3(y+6) - 5(y-1)$ oe isw B1 for denominator $(y-1)(y+6)$ oe isw
3(b)	$\frac{2v+3}{v+4}$ final answer nfw	3	B1 for $(2v+3)(v-4)$ seen B1 for $(v+4)(v-4)$ seen
3(c)	$3x^2 - 11x + 9 [= 0]$	B1	
	$\frac{-(-11) \pm \sqrt{(-11)^2 - 4 \times 3 \times 9}}{2 \times 3}$ OR $x = \frac{11}{6} \pm \sqrt{\frac{13}{36}}$	B2	B1 for $\sqrt{(-11)^2 - 4 \times 3 \times 9}$ soi or for $\frac{11 \pm \sqrt{\text{their } 13}}{2 \times 3}$ OR B1 for $3\left(x - \frac{11}{6}\right)^2 - \frac{121}{12} + 9 = 0$ oe
	2.43 and 1.23	B3	

Question	Answer	Marks	Partial Marks
4(a)	49.7 or 49.72 to 49.74	3	M1 for [time =] $\frac{25}{82} + \frac{36}{60}$ oe or $36 + \left(\frac{25}{82}\right) \times 60$ oe M1 for $45 \div \text{their time}$
4(b)	45.6	3	B1 for 47.5 or 62.5 used M1 for $\frac{\text{their } 47.5}{\text{their } 62.5} [\times 60]$
4(c)	$\frac{9}{64}$	2	M1 for $\frac{3}{8} \times \frac{3}{8}$

Question	Answer	Marks	Partial Marks
5(a)	13.8 or 13.78 to 13.79	2	M1 for $\frac{1}{2} \times 6 \times 6 \times \sin 130$ oe After 0, SC1 for answer 55.2 or 55.15 to 55.16
5(b)	15.7 or 15.70 to 15.71	2	M1 for $\frac{180-130}{360} \times \pi \times 6^2$ oe After 0, SC1 for answer 62.8 or 62.83 to 62.84
5(c)	27.7 or 27.8 or 27.74 to 27.80... 	4	M2 for $2 \times \text{their } 13.8 + 2 \times$ $(\text{their } 15.71 - \frac{1}{2} \times 6^2 \times \sin(180 - 130))$ or M1 for $\text{their } 15.71 - \frac{1}{2} \times 6^2 \times \sin(180 - 130)$ AND M1 for $\frac{\text{their } 31.42}{\pi \times 6^2} [\times 100]$

Question	Answer	Marks	Partial Marks
6(a)	Acceptable justification eg Length = $\frac{18}{x}$ leading to answer or $y = x + x + \frac{18}{x}$	1	
6(b)(i)	20, 13, 20	2	B1 for two correct
6(b)(ii)	Correct smooth curve	3	B2FT for 8 or 9 points correctly plotted or B1FT for 6 or 7 points correctly plotted
6(c)	1.6 to 1.8 and 5.2 to 5.4	2	FT reading their graph at $y = 14$ Tolerance ± 1 mm B1FT for one correct
6(d)(i)	240	2	B1 for $y = 12$ soi
6(d)(ii)	7.4 to 7.7	2	B1 for 17.5 soi

Question	Answer	Marks	Partial Marks
7(a)(i)	Triangle B at $(-4, -2)$, $(-6, -2)$, $(-4, -6)$	2	B1 for two vertices correct or two correct pairs of coordinates soi or correct size and orientation but wrong position
7(a)(ii)	Enlargement, centre $(0, 0)$ oe, scale factor -2	2	B1 for enlargement
7(a)(iii)	$1 : 4$ oe	1	
7(b)	Triangle C at $(-4, 2)$, $(-6, 2)$, $(-4, 6)$	2	FT reflection of <i>their</i> triangle B in x-axis B1FT for two vertices correct
7(c)	$\frac{1}{3} \begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$ or $\begin{pmatrix} 1 & 0 \\ 0 & \frac{1}{3} \end{pmatrix}$ isw	2	B1 for $k \begin{pmatrix} 3 & 0 \\ 0 & 1 \end{pmatrix}$ oe with $k \neq \frac{1}{3}$ or for $\frac{1}{3} \begin{pmatrix} \cdot & \cdot \\ \cdot & \cdot \end{pmatrix}$

Question	Answer	Marks	Partial Marks
8(a)(i)	Ruled line from $(-4, 2)$ to $(0, -2)$	2	B1 for short or unruled line or for two correct coordinates soi
8(a)(ii)	Correct region shaded	2	B1 for line $y = 2$ drawn
8(b)	Gradient of $2y = x + 4$ is $\frac{1}{2}$ soi so Gradient of line L is -2	B1	
	$8 = -2 \times 1 + c$	M1	FT substitution of $(1, 8)$ into $y = \text{their } mx + c$ for L
	Rearrangement to $c = 10$ and hence showing $y = 10 - 2x$	A1	
8(c)	$(8.4, 6.2)$ oe from algebra	3	M1 for a correct method to eliminate one variable A1 for either $x = 8.4$ or $y = 6.2$ nfw After A0 , SC1 for a pair of values that satisfy either equation or for correct answers with no working

Question	Answer	Marks	Partial Marks
9(a)	$AE^2 = \left(\frac{4.3}{2}\right)^2 + \left(\frac{6.2}{2}\right)^2$ oe or $FX^2 = 9.5^2 - \left(\frac{4.3}{2}\right)^2$ or $FY^2 = 9.5^2 - \left(\frac{6.2}{2}\right)^2$	M2	M1 for $AC^2 = 4.3^2 + 6.2^2$ oe or $FX^2 + \left(\frac{4.3}{2}\right)^2 = 9.5^2$ or $FY^2 + \left(\frac{6.2}{2}\right)^2 = 9.5^2$
	$[EF^2 =] 9.5^2 - \text{their } AE^2$ oe or $[EF^2 =] \text{their } FX^2 - \left(\frac{6.2}{2}\right)^2$ or $[EF^2 =] \text{their } FY^2 - \left(\frac{4.3}{2}\right)^2$	M1	Dep on M2
	8.718 to 8.719	A1	
9(b)	77.47 to 77.50	2	M1 for $\frac{1}{3} \times 6.2 \times 4.3 \times 8.72$
9(c)	38.1° or 38.09...°	3	M2 for $2 \sin^{-1}\left(\frac{3.1}{9.5}\right)$ oe or M1 for $\sin^{-1}\left(\frac{3.1}{9.5}\right)$ oe Alternative method: M2 for $\cos AFB = \frac{9.5^2 + 9.5^2 - 6.2^2}{2 \times 9.5 \times 9.5}$ or M1 for $6.2^2 = 9.5^2 + 9.5^2 - 2 \times 9.5 \times 9.5 \times \cos AFB$
9(d)	76.1° or 76.2° or 76.14 to 76.18°	2	M1 for $\tan[\dots] = \frac{8.72}{4.3 \div 2}$ oe

Question	Answer	Marks	Partial Marks
10(a)	$\angle BCX = \angle DCY$, [vertically] opposite $\angle XBC = \angle BCX$, $\angle YDC = \angle DCY$, angles in isosceles [triangles] Hence $\angle XBC = \angle YDC$ $\angle CXB = \angle DYC$, third angle in triangle Hence triangles similar	3	B1 for two correct pairs of angles B1 for correct reason for one pair of angles
10(b)(i)	$90 - x$ oe final answer	1	
10(b)(ii)	$180 - 2x$ oe final answer	1	FT 2 $\times$ <i>their</i> algebraic (b)(i)
10(c)	16.64	3	B2 for $CY = 5.12$ soi OR M1 for $\frac{CY}{5.6} = \frac{3.2}{3.5}$ soi M1 for $2 \times \text{their } CY + 2 \times 3.2$ After 0, SC1 for answer 5.12



MATHEMATICS (SYLLABUS D)

4024/21

Paper 2

October/November 2019

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **6** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	16	2	M1 for $\frac{406 - 350}{350} [\times 100]$ or $\frac{406}{350} \times 100$ After 0 scored, SC1 for answer 84
1(b)	No, maximum possible mass is 23.25 kg	2	B1 for $15.5 + 0.25$ or $1.2 + 0.05$ used or M1 for <i>their</i> $15.75 + 6 \times \text{their } 1.25$
1(c)	72[.00] final answer	3	M1 for 245×0.73 M1 for $\frac{\text{their } 178.85 - 124}{0.76}$ oe
1(d)	36.44	3	M1 for $\frac{657}{100} \times 4.3$ M1 for <i>their</i> 28.251×1.29
1(e)	115 805 32.75 131 936 996.84	4	B1 for 115 M1 for $\frac{100 + 6.5}{100} x = 996.84$ soi A1 for 936 B1FT for 32.75 or dinner cost = (<i>their</i> $936 - 805$) $\div 4$
2(a)(i)	Correct histogram with frequency density axis scaled	3	B1 for 4 or more rectangles on correct bases B1 for 4 or more correct frequency densities soi
2(a)(ii)	49	2	M1 for $56 + 24 + 18$ soi
2(b)(i)	2	1	
2(b)(ii)	2.63	2	M1 for $([0 \times 17] + 1 \times 47 + 2 \times 42 + 3 \times 28 + 4 \times 32 + 5 \times 21 + 6 \times 13) \div 200$ oe
2(b)(iii)	$\frac{34}{200}$ oe	1	

Question	Answer	Marks	Partial Marks
2(b)(iv)	0.1222 final answer	3	M2 for $2 \times \frac{13}{200} \times \frac{187}{199}$ oe or M1 for $\frac{k}{200} \times \frac{200-k}{199} [\times 2]$ oe where $0 < k < 200$ If 0 scored, SC1 for $2 \times \frac{13 \times 187}{200^2}$ oe
3(a)	Centre (7, 1), scale factor 2	2	B1 for each
3(b)	Correct rotation, vertices (3, 0), (4, 0), (4, -2), (3, -1)	2	B1 for correct size and orientation but wrong position or SC1 for correct anticlockwise rotation about (1, 0) vertices (-1, 0), (-2, 0), (-1, 1), (-2, 2)
3(c)(i)	Correct transformation, vertices (-2, -1), (-3, -1), (-3, -3), (-2, -2)	2	B1 for three vertices correct or three correct pairs of coordinates soi
3(c)(ii)	Reflection in $y = -x$ oe	2	B1 for reflection B1 for $y = -x$ oe
4(a)	5030 or 5026 or 5027 or 5026.5 to 5027.2	3	M1 for $\frac{1}{3} \pi \times 4^2 \times 15$ M1 for $\pi \times 4^2 \times 95$ After 0 scored, SC1 for answer 20 100 or 20 110 or 20 106 to 20 109
4(b)	$[l =] \sqrt{15^2 + 4^2} (= \sqrt{241})$	M2	M1 for $[l^2 =] 15^2 + 4^2$ oe
	Curved surface area $= 4\pi \times \sqrt{241} + \pi \times 8 \times 95$	M2	M1 for $4\pi \times \text{their} \sqrt{241}$ or $\pi \times 8 \times 95$
	$= 2582.3$ to $2583.03 = 2580$ AG	A1	
4(c)	4800 or 4797.5 to 4803.2	2	M1 for $\left(\frac{150}{95+15}\right)^2$ or $\left(\frac{95+15}{150}\right)^2$ soi
5(a)(i)	$[a =] 3.5$ oe $[b =] -25.25$	2	B1 for $(x + 3.5)^2$ or $a = 3.5$
5(a)(ii)	$x = -3.5 \pm \sqrt{25.25}$	M1	FT <i>their</i> completed square expression
	1.52 -8.52	A1	After 0 scored, B1 for 1.52 and -8.52
5(b)	$\frac{2x+3}{x-4}$ final answer nfw	3	B1 for $(2x+3)(2x-3)$ oe factorisation seen B1 for $(2x-3)(x-4)$ oe factorisation seen

Question	Answer	Marks	Partial Marks
5(c)	$x = 16$	4	M1 for $2x(x - 1) + 6(x + 4) = 2(x + 4)(x - 1)$ M1FT for $2x^2 - 2x + 6x + 24 = 2x^2 + 8x - 2x - 8$ M1FT for $24 + 8 = 6x - 4x$ (may be $8x - 6x$)
6(a)	24 35	1	
6(b)	$n(n+2)$ oe	2	B1 for quadratic expression in n
6(c)(i)	35	3	B2 for 35×37 or 35.8 to 35.9 OR M1 for <i>their</i> $n(n + 2) = 1358$ M1 for solution of <i>their</i> quadratic $\frac{-2 \pm \sqrt{2^2 - 4 \times 1 \times (-1358)}}{2 \times 1}$
6(c)(ii)	7	2	M1FT for $1358 - \text{their (c)(i)} \times (\text{their (c)(i)} + 2)$
7(a)	$\angle PXQ = \angle SXR$, vertically opposite $\angle QPX = \angle RSX$, angles in same segment $\angle PQX = \angle SRX$, angles in same segment Hence similar	3	B1 for two correct pairs of angles identified B1 for correct reasons for two pairs of angles
7(b)(i)	3.5	2	M1 for $\frac{RX}{6.3} = \frac{4.5}{8.1}$ oe
7(b)(ii)	7 : 5 nfww	2	B1 for 6.3 : 4.5 oe nfww
8(a)	$x - 4$	1	
8(b)	$CB = \text{area} \div \text{length} = \frac{80}{x}$ and $CQ = CB - 4$ oe	1	
8(c)	$[y =] 80 - \frac{1}{2}(x - 4)\left(\frac{80}{x} - 4\right)$	M1	FT <i>their</i> expression from (a)
	$80 - \frac{320}{x} - 4x + 16$	M1	FT <i>their</i> expression from (a) of the form $ax + b$
	Correct working leading to $y = 32 + 2x + \frac{160}{x}$ AG	A1	
8(d)	74	1	
8(e)	Correct smooth curve	3	B2FT for 8 or 9 points correctly plotted or B1FT for 6 or 7 points correctly plotted
8(f)	67.4 up to but not including 68	1	

Question	Answer	Marks	Partial Marks
9(a)	$\cos \hat{BAC} = \frac{950^2 + 520^2 - 680^2}{2 \times 950 \times 520}$	M2	or M1 for $680^2 = 950^2 + 520^2 - 2 \times 950 \times 520 \times \cos \hat{BAC}$ oe
	$\hat{BAC} = 44.01 \text{ to } 44.02 [= 44.0^\circ]$	A1	
9(b)	349	1	
9(c)	4 min 53 s	4	M2 for [distance =]520 cos44 or M1 for $\cos 44 = \frac{d}{520}$ oe AND M1 for <i>their</i> distance $\div 4.6$
9(d)	14.8° or 14.78 to 14.79	4	M2 for $h = 950 \tan 10.7$ oe or M1 for $\tan 10.7 = \frac{h}{950}$ oe AND M1 for $\tan [] = \frac{\text{their } h}{680}$ oe
10(a)	10.6[3...]	2	M1 for $\sqrt{(3 - -4)^2 + (5 - -3)^2}$ oe
10(b)	Gradient = $-\frac{1}{3}$ oe	M1	
	Substitutes pair of values into $y = \text{their} \left(-\frac{1}{3}\right)x + c$ to find c	M1	
	$y = -\frac{1}{3}x + \frac{1}{3}$ oe rearranged to $3y + x = 1$ AG	A1	
10(c)	[y =] $3x + 9$	3	B1 for gradient = 3 soi M1 for substituting $(-4, -3)$ into $y = \text{their } 3x + c$



MATHEMATICS (SYLLABUS D)

4024/22

Paper 2

October/November 2019

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **7** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

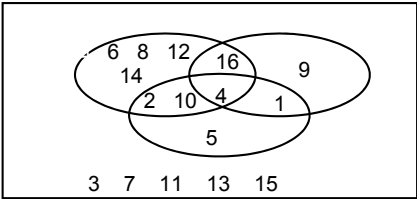
GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	2356	2	M1 for product of any three of 15.20, $7\frac{3}{4}$, 5 and 4
1(b)	14	2	M1 for $\frac{25700 - 22102}{25700} [\times 100]$ or $\frac{22102}{25700} \times 100$ After 0 scored, SC1 for answer 86
1(c)	375	3	M2 for $\frac{465.75}{1.08 \times 1.15}$ oe or B1 for 1.08 or 1.15 oe seen After 0 scored, SC1 for answer 379 or 378.7[0] or 378.65 to 378.66
1(d)	601.75 or 601.76	3	M2 for $8500 \times \left(1 + \frac{3.1}{100}\right)^5$ oe or M1 for $8500 \times \left(1 + \frac{3.1}{100}\right)^k$ oe where $k > 1$
2(a)	$y = -1$ oe	1	
2(b)	Enlargement Scale factor -3 Centre $(-3, 2)$	3	B1 for each
2(c)	Correct transformation, vertices $(5, -1)$, $(6, -1)$, $(6, -3)$, $(5, -2)$	2	B1 for three vertices correct or three correct pairs of coordinates soi
3(a)(i)	6 points plotted correctly	2	B1 for 3, 4 or 5 points plotted correctly
3(a)(ii)	4	1	
3(a)(iii)	Positive	1	
3(a)(iv)	Ruled line of best fit	1	
3(a)(v)	<i>Their</i> time for 800 m at 65 s for 400 m	1	Strict FT their straight line of best fit

Question	Answer	Marks	Partial Marks
3(b)(i)	$p+10+15+13+q = 50$ oe	1	
3(b)(ii)	$142.5p+147.5\times 10+152.5\times 15+157.5\times 13+162.5q=153.6\times 50$ oe simplified to $142.5p+162.5q = 1870$	2	B1 for $142.5p$, 147.5×10 , 152.5×15 , 157.5×13 and $162.5q$ seen or for 153.6×50 seen
3(b)(iii)	Correct method to eliminate one variable	M1	
	$[p =]4$ $[q =]8$	A2	A1 for one correct or B1 only for correct answers without algebraic method
4(a)	-1.8	1	
4(b)	Correct smooth curve	3	B2FT for 8 or 9 points correctly plotted or B1FT for 6 or 7 points correctly plotted
4(c)	Tangent drawn at (1, 4.8)	B1	Dep on <u>curve</u> drawn between (0, 3) and (2, 5.4)
	1.2 to 1.6	B1	Dep on close attempt at tangent
4(d)(i)	Ruled line through (-2, 5) to (2, 3) crossing curve three times	2	B1 for short or unruled line or for two correct coordinates soi
4(d)(ii)	-3.8 to -3.7 0.4 to 0.5 3.3 to 3.4	2	FT intersection of <i>their</i> line with <i>their</i> 'curve' B1FT for two correct
4(d)(iii)	$A = -25$ $B = 10$	3	B2 for one correct or M1 for $\frac{8-x}{2} = 3 + 2x - \frac{x^3}{5}$ oe
5(a)(i)	Correctly completed Venn diagram 	3	B2 for Venn diagram with one or two errors, omissions or repeats or for correct Venn diagram with 3, 7, 11, 13, 15 omitted or B1 for Venn diagram with three or four errors, omissions or repeats or for correct Venn diagram with 3, 7, 11, 13, 15 omitted and <u>one</u> other error, omission or repeat
5(a)(ii)	10	1	
5(a)(iii)	2, 4, 10	1	FT <i>their</i> Venn diagram
5(b)(i)	$\frac{1}{8}$ oe	1	

Question	Answer	Marks	Partial Marks
5(b)(ii)	$\frac{1}{40}$ oe	2	M1 for $\frac{k}{16} \times \frac{k-1}{15}$ or SC1 for answer $\frac{9}{256}$
6(a)	$\frac{3-5v}{v}$ oe final answer	2	M1 for correct first step $v(p+5) = 3$ or better
6(b)	$\frac{x^2-15}{(2x-5)(x-6)}$ or $\frac{x^2-15}{2x^2-17x+30}$ final answer	3	B1 for $x(x-6)+3(2x-5)$ oe soi B1 for denominator $(2x-5)(x-6)$ oe
6(c)	$[x=]-\frac{3}{10}$ oe	3	M1 for $4x+5 = 2(1-3x)$ soi M1 for isolating x terms: $4x+6x = 2-5$ or better
6(d)	$5x+15 = 4x^2-2x$	B1	
	$4x^2-7x-15 [= 0]$ or $15+7x-4x^2 [= 0]$	M1	
	$(4x+5)(x-3) [= 0]$	M1	or for $x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 4 \times (-15)}}{2 \times 4}$
	$[x=]-\frac{5}{4}$ oe, $[x=]3$	B1	
7(a)	[0]67.3 or [0]67.29...	4	B3 for $[\angle SPR =] 25.3$ or $25.29...$ or M2 for $[\sin SPR =] \frac{146 \sin 108}{325}$ or M1 for $\frac{146}{\sin SPR} = \frac{325}{\sin 108}$ oe AND M1 for <i>their</i> $SPR+42$
7(b)(i)	$[QR^2 =] 280^2 + 325^2 - 2 \times 280 \times 325 \times \cos 38$	M1	
	$= 201.5... [= 202]$	A2	A1 for $[QR^2 =] 40\ 607.[...]$
7(b)(ii)	2 minutes 12 seconds	3	M2 for $\frac{202}{1000 \times 5.5} \times 60 [\times 60]$ oe or M1 for $\frac{\text{figs } 202}{\text{figs } 5.5}$
8(a)	9300 or 9299 to 9301	3	M2 for $\frac{1}{3} \pi \times 16^2 \times 60 - \frac{1}{3} \pi \times 12^2 \times 45$ oe or M1 for $\frac{1}{3} \pi \times 16^2 \times 60$ or $\frac{1}{3} \pi \times 12^2 \times 45$

Question	Answer	Marks	Partial Marks
8(b)	$[c^2=]12^2+45^2$	M1	
	$[c=]46.57\dots$	A1	
8(c)	1820 or 1816 to 1819.[0...]	4	B2 for $l = 62.09$ to 62.13 or M1 for $\sqrt{60^2 + 16^2}$ oe and M1 for $\pi \times 16 \times \text{their } 62.1 - \pi \times 12 \times 46.6$ [$+\pi \times 12^2$] If 0 scored, SC1 for $\pi \times 12^2$
9(a)(i)	$10 - x$ final answer	1	
9(a)(ii)	$12 - x$ final answer	1	
9(b)	$\frac{(10-x)(12-x)}{10 \times 12} = \frac{3}{4}$	M1	FT <i>their</i> algebraic <i>AR</i> and <i>AP</i>
	$120 - 12x - 10x + x^2$ seen	M1	FT Correct expansion of <i>their</i> brackets
	Correct expansion and rearrangement to $x^2 - 22x + 30 = 0$	A1	Dep on correct <i>AR</i> and <i>AP</i>
9(c)	$\frac{-(-22) \pm \sqrt{(-22)^2 - 4 \times 1 \times 30}}{2 \times 1}$	B2	B1 for $\sqrt{(-22)^2 - 4 \times 1 \times 30}$ or for $\frac{-(-22) \pm \sqrt{\text{their } 364}}{2 \times 1}$
	1.46, 20.54	B1	
9(d)	27.9 or 27.85 to 27.87...	2	M1 for use of <i>their</i> 1.46 to find an area e.g. $1.46(10 - 1.46)$, $1.46(12 - 1.46)$, 1.46^2 , etc.
10(a)	$AC=BD$ equal diameters AB is common $\angle ABC = \angle BAD = 90^\circ$ angle in semicircle Congruent RHS	3	B1 for correct pair of angles and one correct pair of sides or for two correct pairs of sides B1 for correct reasons for two pairs of sides/angles
10(b)(i)	124°	2	B1 for $\angle ADB$ or $\angle BCA = 62^\circ$ soi or $\angle AOD = 56^\circ$ soi or $\angle AOB = 124^\circ$ soi

Question	Answer	Marks	Partial Marks
10(b)(ii)	12.8 or 12.77 to 12.78	5	M4 for $4 \times 4 \tan\left(\frac{\text{their } 124}{2}\right) - \frac{\text{their } 124}{360} \times \pi \times 4^2$ oe OR M1 for $DT = 4 \tan\left(\frac{\text{their } 124}{2}\right)$ oe or $OT = 4 \div \cos\left(\frac{\text{their } 124}{2}\right)$ oe M1 for [area kite =] $4 \times \text{their } DT$ oe or $\text{their } OT \times 4 \sin\left(\frac{\text{their } 124}{2}\right)$ oe M1 for [sector area =] $\frac{\text{their } 124}{360} \times \pi \times 4^2$ oe